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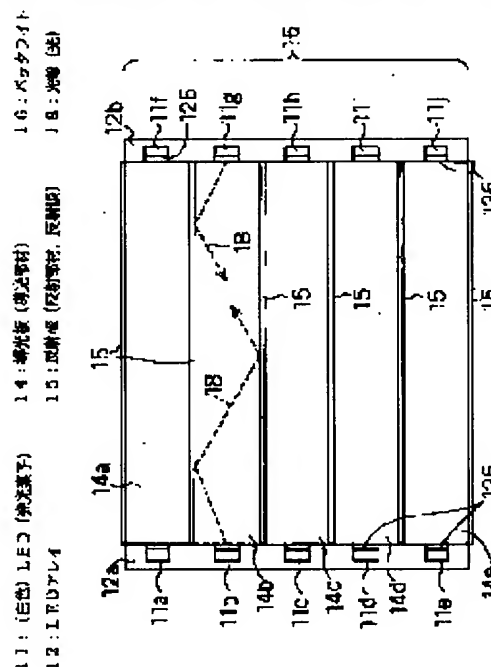
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(54) LUMINAIRE, VIDEO DISPLAY DEVICE, METHOD OF DRIVING VIDEO DISPLAY DEVICE, LIQUID CRYSTAL DISPLAY PANEL, METHOD OF MANUFACTURING LIQUID CRYSTAL DISPLAY PANEL, METHOD OF DRIVING LIQUID CRYSTAL DISPLAY PANEL, ARRAY SUBSTRATE, DISPLAY DEVICE, VIEWFINDER AND VIDEO CAMERA

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a video display device which prevent a moving picture from blurring and to provide its related apparatuses.

SOLUTION: A backlight 16 is arranged on a backface of a video display device 21. A light guide plate 14 which constitutes the backlight 16 is comprised of a plurality of blocks. A white LED 11 or R, G or B LED is arranged at the end of the light guide plate 14. This white LED turns on solely or as a group of plurality of them, and positions of the white LED to turn on are scanned in synchronism with positions of the video display device 21 to write into an image. When re-writing all pixel rows of the video display device 21, the white LEDs 11 that are located at the re-written pixel rows turn on after a predetermined time has passed, and an image is displayed.



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CLAIMS

[Claim(s)]

[Claim 1] The lighting system characterized by providing an optical Rhine-like generating means, a protection-from-light means to carry out outgoing radiation of the light to the shape of a slit from said optical generating means, a rotation means to rotate said optical generating means or said protection-from-light means in the center of rotation, and the light guide plate that carries out the light guide of the light by which outgoing radiation was carried out from said slit.

[Claim 2] It is the lighting system which possesses a light guide plate, the optical generating means arranged in the shape of a matrix on said light guide plate, and the optical diffusion means formed or arranged in the optical outgoing radiation side of said light guide plate, and is characterized by for the light emitting device which generates the homogeneous light approaching, and arranging and constituting said optical generating means.

[Claim 3] It is the lighting system which possesses the optical generating means formed or arranged at each of the light guide plate constituted by dividing two or more protection-from-light objects or reflectors, and said divided light guide plate, and the optical diffusion means which have been formed or arranged in the optical outgoing-radiation side of said light guide plate, and is characterized by for the light emitting device which generates the homogeneous light to approach, and to be arranged and constituted said optical generating means.

[Claim 4] The graphic display device characterized by providing one of lighting systems according to claim 3, and the liquid crystal display panel which modulates the outgoing radiation light from said lighting system from claim 1.

[Claim 5] The 1st substrate with which the crevice was formed in the shape of a matrix, and the black matrix formed in said crevice, The liquid crystal display panel characterized by the field in which the liquid crystal layer pinched between the 2nd substrate with which the pixel was formed in the shape of a matrix, and said 1st substrate and 2nd substrate was provided, and said crevice of said 1st substrate was formed, and the field in which said pixel of said 2nd substrate was formed having countered.

[Claim 6] The 1st substrate with which the crevice was formed in the shape of a matrix, and the black matrix formed in said crevice, The field in which the liquid crystal layer pinched between the 2nd substrate with which the pixel was formed in the shape of a matrix, and said 1st substrate and 2nd substrate was provided, and said crevice of said 1st substrate was formed, The liquid crystal display panel characterized by for the field in which said pixel of said 2nd substrate was formed having countered, forming the smoothing film on said black matrix, and forming the counterelectrode on said smoothing film.

[Claim 7] The 1st process which possesses the 1st substrate with light transmission nature, and the 2nd substrate with which the pixel electrode was formed in the shape of a matrix, and forms a crevice in said 1st substrate in the shape of a matrix, The 2nd process which forms in said crevice the metal thin film which has silver or aluminum, The manufacture approach of the liquid crystal display panel characterized by including the 3rd process which forms the smoothing film which has light transmission nature on said thin film, and the 4th process which makes liquid crystal pinch between said 1st substrate and said 2nd substrate.

[Claim 8] The 1st substrate with which the crevice was formed in the shape of a matrix, and the black matrix formed in said crevice, The addition capacitor formed in said 1st substrate, and the 2nd substrate with which the pixel was formed in the shape of a matrix, The field in which the liquid crystal layer pinched between the connection which connects said addition capacitor and said pixel electrode, and said 1st substrate and 2nd substrate was provided, and said crevice of said 1st substrate was formed, The liquid crystal display panel characterized by the field in which said pixel of said 2nd substrate was formed having countered.

[Claim 9] The lighting system characterized by providing the 1st light guide plate, 1st luminescence means to input the flux of light into said 1st light guide plate, the 2nd light guide plate, 2nd luminescence means to input the flux of light into said 2nd light guide plate, and the control means that controls turning on and off of said 1st luminescence means and said 2nd luminescence means.

[Claim 10] The 1st light guide plate and 1st luminescence means to input the flux of light into said 1st light guide plate, The 2nd light guide plate and 2nd luminescence means to input the flux of light into said 2nd light guide plate, The control means which controls turning on and off of said 1st luminescence means and said 2nd luminescence means, The graphic display device characterized by providing the optical diffusion means arranged in each optical outgoing radiation side of said 1st light guide plate and the 2nd light guide plate, and the liquid crystal display panel arranged at the optical outgoing radiation side of said optical diffusion means.

[Claim 11] The drive approach of the graphic display device characterized by having the process which turns on said 1st luminescence means, and the process which turns on said 2nd luminescence means in the 2nd time amount

which is rewriting the image in the lower half of a screen by the 1st time amount which is the drive approach of the graphic display device using a graphic display device according to claim 10, and is rewriting the image in the upper half of a screen.

[Claim 12] A light guide plate and the 1st luminescence means arranged or formed in the upper limit section of said light guide plate, The 2nd luminescence means arranged or formed in the lower limit section of said light guide plate, and the control means which controls turning on and off of said 1st luminescence means and said 2nd luminescence means, The graphic display device characterized by providing the optical diffusion means arranged in the optical outgoing radiation side of said light guide plate, and the liquid crystal display panel arranged at the optical outgoing radiation side of said optical diffusion means.

[Claim 13] In the 1st time amount which is the drive approach of the graphic display device using a graphic display device according to claim 12, and is rewriting the screen of a liquid crystal display panel In the off process which makes an OFF state said 1st and 2nd luminescence means, and the 2nd time amount which is not rewriting the screen of a liquid crystal display panel The drive approach of the graphic display device which is equipped with the ON process which makes an ON state said 1st or 2nd luminescence means, and is characterized by making said 1st luminescence means and said 2nd luminescence means turn on by turns in said ON process.

[Claim 14] The graphic display device characterized by providing the optical diffusion means arranged between the 1st liquid crystal display panel which has a stripe-like electrode, the 2nd liquid crystal display panel which displays an image, and said 1st liquid crystal display panel and said 2nd liquid crystal display panel.

[Claim 15] The 1st substrate which has a stripe-like electrode, and the 2nd substrate which has a pixel electrode, The liquid crystal display panel characterized by providing the 1st liquid crystal layer which has the macromolecule pinched between the 3rd electrode which has the function of a counterelectrode, and the electrode of the shape of said stripe and said 3rd electrode, and a liquid crystal molecule, and the 2nd liquid crystal layer pinched between said pixel electrode and said 3rd electrode.

[Claim 16] The 1st substrate which has a stripe-like electrode, and the 2nd substrate which has a pixel electrode, The 1st liquid crystal layer which has the macromolecule pinched between the 3rd electrode which has the function of a counterelectrode, and the electrode of the shape of said stripe and said 3rd electrode, and a liquid crystal molecule, The 2nd liquid crystal layer pinched between said pixel electrode and said 3rd electrode, The graphic display device characterized by providing the back light arranged at said 1st substrate side, the 1st driver circuit which impresses a video signal to said pixel electrode, and the 2nd driver circuit which impresses driver voltage to the electrode of the shape of said stripe.

[Claim 17] The drive approach of the graphic display device characterized by having the process which is the drive approach of the graphic display device using a graphic display device according to claim 16, impresses an electrical potential difference to the 1st liquid crystal layer corresponding to said part after rewriting the image of said 2nd liquid crystal layer, and carries out incidence of the light of said back light to said 1st liquid crystal layer.

[Claim 18] The lighting system characterized by providing the light modulation layer pinched between the 1st substrate which has a matrix-like electrode, the 2nd substrate which has a common electrode, and the electrode of the shape of said matrix and said common electrode.

[Claim 19] Said light modulation layer is a lighting system according to claim 18 characterized by being a macromolecule distribution liquid crystal layer or TN liquid crystal layer.

[Claim 20] The lighting system which possesses the light modulation layer pinched between the 1st substrate which has a stripe-like electrode, the 2nd substrate which has a common electrode, and the electrode of the shape of said matrix and said common electrode, and is characterized by the width of face of the electrode of the shape of said stripe being narrow in the center section, and being wide in the vertical section.

[Claim 21] What possesses the light modulation layer pinched between the 1st substrate which has a matrix-like electrode, the 2nd substrate which has a common electrode, and the electrode of the shape of said matrix and said common electrode, and the magnitude of the electrode of the shape of said matrix has in the center section of said 1st substrate is small, and is in a periphery is a lighting system characterized by the large thing.

[Claim 22] The lighting system characterized by illuminating one liquid crystal display panel by setting to the lighting system which has two or more lighting fields, and making said lighting field turn on or switch off according to an individual in two or more fields.

[Claim 23] The graphic display device characterized by providing the lighting system which has the lighting field of the shape of two or more stripe, and the liquid crystal display panel which has the pixel line of 1 for the lighting field of the shape of said stripe, the same number, or an integer.

[Claim 24] The drive approach of the lighting system which is the drive approach of the graphic display device using a graphic display device according to claim 23, and is characterized by having the process which turns on the lighting field of the shape of odd-numbered stripe in the odd number field, and the process which turns on the lighting field of the shape of even-numbered stripe in the even number field.

[Claim 25] The graphic display device characterized by providing the liquid crystal display panel which has the image display field divided into two or more fields, and the lighting system which has the lighting field divided into two or more fields.

[Claim 26] The drive approach of the graphic display device characterized by having the process which turns on the lighting field which is the drive approach of the graphic display device using a graphic display device according to claim 25, and is located in the oddth in the 1st predetermined field, and the process which turns on the lighting field located in the eventh in said 1st field.

[Claim 27] The drive approach of the graphic display device which is the drive approach of the graphic display

device using a graphic display device according to claim 25, and is characterized by having the process which changes said lighting area size actively with display-image data.

[Claim 28] The drive approach of the graphic display device characterized by having the process which is the drive approach of the graphic display device using a graphic display device according to claim 25, and generates two lighting fields at the same time of day.

[Claim 29] The drive approach of the graphic display device characterized by having the process which is the drive approach of the graphic display device using a graphic display device according to claim 25, and performs an image display condition and a whole surface black display condition by turns.

[Claim 30] The graphic display device characterized by providing the liquid crystal layer pinched between the 1st substrate with which the pixel was formed in the shape of a matrix, the 2nd substrate with which the counterelectrode was formed, and said 1st substrate and said 2nd substrate, and an opposite signal impression means to impress the signal which makes the display screen a black display to said counterelectrode.

[Claim 31] The graphic display device characterized by providing the liquid crystal layer pinched between the 1st substrate with which the pixel was formed in the shape of a matrix, the 2nd substrate with which the counterelectrode of the shape of two or more stripe formed in the pixel line writing direction of said pixel was formed, and said 1st substrate and the 2nd substrate.

[Claim 32] The graphic display device characterized by providing the liquid crystal layer pinched between the 1st substrate which has the pixel electrode formed in the shape of a matrix, and two or more stripe-like electrodes formed in the pixel line writing direction of said pixel electrode, the 2nd substrate with which the counterelectrode was formed, and said 1st substrate and 2nd substrate.

[Claim 33] The pixel electrode arranged in the shape of a matrix, and the 1st thin film transistor component which impresses a signal to said pixel electrode and the 2nd thin film transistor component, The source signal line arranged said pixel inter-electrode and the 1st gate signal line arranged said pixel inter-electrode, The source driver which impresses a video signal to the 2nd gate signal line and said source signal line arranged said pixel inter-electrode, The 1st gate driver which impresses an on-off electrical potential difference to the 1st gate signal line, The 2nd gate driver which impresses an on-off electrical potential difference to the 2nd gate signal line is provided. The gate terminal of said 1st thin film transistor component is connected to said 1st gate signal line. The source terminal of said 1st thin film transistor component is connected to said source signal line. The drain terminal of said 1st thin film transistor component is connected to said pixel electrode. The gate terminal of said 2nd thin film transistor component is connected to said 2nd gate signal line. It is the liquid crystal display panel characterized by connecting the source terminal of said 2nd thin film transistor component to said source signal line, and connecting the drain terminal of said 2nd thin film transistor component to said pixel electrode.

[Claim 34] The drive approach of the liquid crystal display panel which is the drive approach of the liquid crystal display panel using a liquid crystal display panel according to claim 33, and is characterized by having the process which makes an ON state said 2nd thin film transistor component at the blanking period of a video signal, and the process which makes an ON state said 1st thin film transistor component at the data period of a video signal.

[Claim 35] The pixel electrode arranged in the shape of a matrix, and the 1st thin film transistor component which impresses a signal to said pixel electrode and the 2nd thin film transistor component, The source signal line arranged said pixel inter-electrode and the 1st gate signal line arranged said pixel inter-electrode, The 2nd gate signal line arranged said pixel inter-electrode and the common signal line arranged said pixel inter-electrode, The source driver which impresses a video signal to said source signal line, and the reset driver which impresses a signal to said common signal line, The 1st gate driver which impresses an on-off electrical potential difference to said 1st gate signal line, The 2nd gate driver which impresses an on-off electrical potential difference to said 2nd gate signal line is provided. The gate terminal of said 1st thin film transistor component is connected to said 1st gate signal line. The source terminal of said 1st thin film transistor component is connected to said source signal line. The drain terminal of said 1st thin film transistor component is connected to said pixel electrode. The gate terminal of said 2nd thin film transistor component is connected to said 2nd gate signal line. It is the liquid crystal display panel characterized by connecting the source terminal of said 2nd thin film transistor component to said common signal line, and connecting the drain terminal of said 2nd thin film transistor component to said pixel electrode.

[Claim 36] The pixel electrode arranged in the shape of a matrix, and the 1st thin film transistor component which impresses a signal to said pixel electrode and the 2nd thin film transistor component, The source signal line arranged said pixel inter-electrode and the 1st gate signal line arranged said pixel inter-electrode, The 2nd gate signal line arranged said pixel inter-electrode and the common signal line arranged said pixel inter-electrode, The 1st source driver which impresses a video signal to the 1st source signal line, The 2nd source driver which impresses a video signal to the 2nd source signal line, The reset driver which impresses a signal to a common signal line, and the 1st gate driver which impresses an on-off electrical potential difference to the 1st gate signal line, The 2nd gate driver which impresses an on-off electrical potential difference to the 2nd gate signal line is provided. The gate terminal of said 1st thin film transistor component is connected to said 1st gate signal line. The source terminal of said 1st thin film transistor component is connected to said 1st source signal line. The drain terminal of said 1st thin film transistor component is connected to said pixel electrode. The gate terminal of said 2nd thin film transistor component is connected to said 2nd gate signal line. It is the liquid crystal display panel characterized by connecting the source terminal of said 2nd thin film transistor component to said 2nd source signal line, and connecting the drain terminal of said 2nd thin film transistor component to said pixel electrode.

[Claim 37] The 1st data-processing means which carries out adjustable [of the standup electrical potential difference and amplitude of a video signal which a video signal has, and which are impressed to a liquid crystal

display panel based on at least one brightness data among the average luminance of a screen, the maximum brightness, and the minimum brightness], The graphic display device characterized by providing the 2nd data-processing means which said video signal has, and which carries out adjustable [of the electrical potential difference impressed to a lighting system based on at least one brightness data among the average luminance of a screen, the maximum brightness and the minimum brightness].

[Claim 38] It is the array substrate which a viewing area and the 1st and 2nd source DORAIPU circuits formed in the periphery of said viewing area with the polish recon technique are provided, and said viewing area uses an amorphous silicon thin film as the semi-conductor film, and is characterized by forming the transistor component, and for a periphery using a polish recon thin film as the semi-conductor film, and forming the transistor component.

[Claim 39] The viewfinder characterized by providing an optical generating means, an integrator lens, the polarization conversion means that carries out polarization conversion of the light from said optical generating means, a liquid crystal display panel, and the magnifying lens expand the display image of said liquid crystal display panel, and make it an observer catch sight of.

[Claim 40] The video camera characterized by providing a graphic display device according to claim 4 and an image pick-up means.

[Claim 41] The graphic display device characterized by providing the optical coupling material which carries out optical coupling of a liquid crystal display panel, a radii-like transparence member, said transparence member, and the display screen of said liquid crystal display panel.

[Claim 42] The 1st substrate and the 2nd substrate which has a reflector periodic as a lot for three pixels, The field where the liquid crystal layer ****(ed) between the micro-lens array arranged in said 1st substrate side, and said 1st substrate and 2nd substrate was provided, and said micro-lens array of said 1st substrate has been arranged, The liquid crystal display panel characterized by the field in which said pixel of said 2nd substrate was formed having countered.

[Claim 43] It is the display characterized by providing a liquid crystal display panel and the prism plate arranged at the optical plane of incidence of said liquid crystal display panel, and for said prism plate inclining to a predetermined include angle to the direction of a field of said liquid crystal panel, and the direction which intersects perpendicularly, and forming the air gap.

[Claim 44] The lighting system characterized by providing the 1st transparence block which has a parabolic reflector, the 2nd transparence block of the shape of a wedge arranged in the optical outgoing radiation side of said 1st transparence block, and the light emitting device arranged near the abbreviation focus of said transparence block.

[Claim 45] The viewfinder characterized by providing a lighting system according to claim 44, a liquid crystal display panel, and the magnifying lens expand the display image of said liquid crystal display panel, and make it an observer catch sight of.

[Claim 46] The viewfinder characterized by providing the 2nd transparence block of the shape of rust, and the display panel of the reflective mold arranged at the whole surface of said 1st transparence block set and arrange few air gaps to a light emitting device, the 1st transparence block which has the ramp of the critical angle which carries out total reflection of the light from said light emitting device, and said ramp.

[Claim 47] It is the viewfinder characterized by carrying out incidence to said display panel after providing the transparence block arranged at the optical plane of incidence of the display panel of a reflective mold, and said reflective type of display panel, and a light emitting device and carrying out total reflection of the light from said light emitting device in one aspect of said transparence block.

[Claim 48] The program documentation medium characterized by reading being possible by computer which recorded the program and/or data for performing the function of all or a part of means [all or a part of] of lighting systems according to claim 9 or 22 by computer.

[Claim 49] The program documentation medium characterized by reading being possible by computer which recorded the program and/or data for performing the function of all or a part of means [all or a part of] of graphic display devices according to claim 10, 12, or 37 by computer.

[Claim 50] The program documentation medium characterized by a readout being possible by computer which recorded the program and/or data for making either of claims 11, 13, 17, 24, 26-29 perform actuation of all or a part of processes [all or a part of] of the drive approaches of the graphic display device of a publication by computer.

[Claim 51] The program documentation medium characterized by a readout being possible by computer which recorded the program and/or data for performing actuation of all or a part of processes [all or a part of] of the drive approaches of a liquid crystal display panel according to claim 34 by computer.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the direct viewing type indicating equipment using the display panel and these which can display a good image also with the lighting system of the display panel which carries out the image quality improvement of animation dotage etc., the graphic display device using it, a direct viewing type, or a reflective mold, a personal digital assistant, a viewfinder, a video camera, a projection mold indicating equipment, etc.

[0002]

[Description of the Prior Art] Small and since [lightweight and] there is little power consumption, many displays to a portable equipment etc. using a liquid crystal display panel are adopted. In recent years, it is adopted also as a liquid crystal display monitor, and the commercial scene is expanded. Moreover, the image quality improvement of a liquid crystal display panel progresses, and the same as the above is carried out in the still picture to the level which is satisfactory practically.

[0003]

[Problem(s) to be Solved by the Invention] If an animation is displayed on a liquid crystal display panel, ***** of an image will appear. This ***** will mean the phenomenon in which a gray shadow appears behind a white ball, if a white ball moves to for example, a black back screen. On these specifications, the condition that ***** has occurred in this way is called animation dotage.

[0004] It is thought that the cause which animation dotage generates is divided greatly and there are two. The 1st cause is the responsibility of liquid crystal. The time amount (this build-up-time + falling time amount is henceforth called in the response time) which in the case of twist pneumatic (TN) liquid crystal fell with standup time amount (time amount taken for permeability to make max 100% from 0%, and to become 90%), and added time amount (time amount taken to become 10% of permeability from the 100% of the maximum permeability) is 50 - 80msec.

[0005] Quick liquid crystal mode also has the response time. It is strong dielectric liquid crystal. However, this liquid crystal cannot perform a gradation display. In addition, antiferroelectric liquid crystal and the liquid crystal in OCB mode are high-speed. The 1st cause can be coped with if the liquid crystal ingredient or the mode of these high speeds is used.

[0006] The 2nd cause is that the permeability of each pixel changes to the field or a frame synchronously. For example, the permeability of a certain pixel is a fixed value between the 1st field (frame). That is, the potential of a pixel electrode is rewritten by every 1 field (frame), and the permeability of a liquid crystal layer changes to it. Therefore, if human being sees the image of a liquid crystal display panel, with the decay characteristic of an eye, a display image will seem to change slowly and animation dotage will occur.

[0007] In addition, on these specifications, time amount until the period, i.e., the potential of 1 pixel of arbitration, which writes and changes one screen is rewritten next is called the field or a frame.

[0008] Displays, such as CRT, scan a fluorescent substance side with an electron gun, and display an image. Therefore, as for each pixel, only the time amount of musc order is displayed in the period of the 1 field (one frame).

[0009] The period of the 1 field (frame), i.e., it seems that the image is displayed continuously, is based on the decay characteristic of human being's eye. That is, in CRT, almost all time amount is a black display, and each pixel is turned on by only the time amount of the order of musc (display). The display condition of this CRT makes a movie display good. It is because almost all time amount is a black display, so an image looks discontinuous and animation dotage does not occur. However, by the liquid crystal display panel, since the period of the 1 field and the image are held, animation dotage is generated.

[0010] This invention was not made in view of the above technical problems, and aims at offering the manufacture approach of the drive approach of the lighting system which animation dotage does not generate, a graphic display device, and a graphic display device, a liquid crystal display panel, and a liquid crystal display panel, the drive approach of a liquid crystal display panel, an array substrate, an indicating equipment, a viewfinder, and a video camera.

[0011]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, this invention is a lighting system characterized by providing an optical Rhine-like generating means, a protection-from-light means to carry out outgoing radiation of the light to the shape of a slit from said optical generating means, a rotation means to rotate

said optical generating means or said protection-from-light means in the center of rotation, and the light guide plate that carries out the light guide of the light by which outgoing radiation was carried out from said slit.

[0012] Moreover, other this inventions possess a light guide plate, the optical generating means arranged in the shape of a matrix on said light guide plate, and the optical diffusion means formed or arranged in the optical outgoing radiation side of said light guide plate, and said optical generating means is a lighting system which the light emitting device which generates the homogeneous light approaches, and is characterized by being arranged and constituted.

[0013] Moreover, other this inventions possess the optical generating means formed or arranged at each of the light guide plate constituted by dividing two or more protection-from-light objects or reflectors, and said divided light guide plate, and the optical diffusion means which have been formed or arranged in the optical outgoing-radiation side of said light guide plate, and said optical generating means is the lighting system which the light emitting device which generates the homogeneous light approaches, and is characterized by to be arranged and constituted.

[0014] Moreover, other this inventions are graphic display devices characterized by providing the lighting system of above-mentioned this invention, and the liquid crystal display panel which modulates the outgoing radiation light from said lighting system.

[0015] Moreover, the 1st substrate with which, as for other this inventions, the crevice was formed in the shape of a matrix, The black matrix formed in said crevice, and the 2nd substrate with which the pixel was formed in the shape of a matrix, It is the liquid crystal display panel characterized by the field in which the liquid crystal layer pinched between said 1st substrate and 2nd substrate was provided, and said crevice of said 1st substrate was formed, and the field in which said pixel of said 2nd substrate was formed having countered. [0016] Moreover, the 1st substrate with which, as for other this inventions, the crevice was formed in the shape of a matrix, The black matrix formed in said crevice, and the 2nd substrate with which the pixel was formed in the shape of a matrix, The field in which the liquid crystal layer pinched between said 1st substrate and 2nd substrate was provided, and said crevice of said 1st substrate was formed, It is the liquid crystal display panel characterized by for the field in which said pixel of said 2nd substrate was formed having countered, forming the smoothing film on said black matrix, and forming the counterelectrode on said smoothing film.

[0017] Moreover, the 1st process which other this inventions possess the 1st substrate with light transmission nature, and the 2nd substrate with which the pixel electrode was formed in the shape of a matrix, and forms a crevice in said 1st substrate in the shape of a matrix, The 2nd process which forms in said crevice the metal thin film which has silver or aluminum, It is the manufacture approach of the liquid crystal display panel characterized by having the 3rd process which forms the smoothing film which has light transmission nature on said thin film, and the 4th process which makes liquid crystal pinch between said 1st substrate and said 2nd substrate.

[0018] Moreover, the 1st substrate with which, as for other this inventions, the crevice was formed in the shape of a matrix, The black matrix formed in said crevice, and the addition capacitor formed in said 1st substrate, The connection which connects the 2nd substrate with which the pixel was formed in the shape of a matrix, and said addition capacitor and said pixel electrode, It is the liquid crystal display panel characterized by the field in which the liquid crystal layer pinched between said 1st substrate and 2nd substrate was provided, and said crevice of said 1st substrate was formed, and the field in which said pixel of said 2nd substrate was formed having countered.

[0019] Moreover, other this inventions are lighting systems characterized by providing the 1st light guide plate, 1st luminescence means to input the flux of light into said 1st light guide plate, the 2nd light guide plate, 2nd luminescence means to input the flux of light into said 2nd light guide plate, and the control means that controls turning on and off of said 1st luminescence means and said 2nd luminescence means.

[0020] Moreover, 1st luminescence means by which other this inventions input the flux of light into the 1st light guide plate and said 1st light guide plate, The 2nd light guide plate and 2nd luminescence means to input the flux of light into said 2nd light guide plate, The control means which controls turning on and off of said 1st luminescence means and said 2nd luminescence means, It is the graphic display device characterized by providing the optical diffusion means arranged in each optical outgoing radiation side of said 1st light guide plate and the 2nd light guide plate, and the liquid crystal display panel arranged at the optical outgoing radiation side of said optical diffusion means.

[0021] Moreover, other this inventions are the drive approaches of a graphic display device of having used the graphic display device of this invention, and are the drive approaches of the graphic display device characterized by having the process which turns on said 1st luminescence means in the 1st time amount which is rewriting the image in the upper half of a screen, and the process which turns on said 2nd luminescence means in the 2nd time amount which is rewriting the image in the lower half of a screen.

[0022] Moreover, 1st luminescence means by which other this inventions were arranged or formed in the upper limit section of a light guide plate and said light guide plate, The 2nd luminescence means arranged or formed in the lower limit section of said light guide plate, and the control means which controls turning on and off of said 1st luminescence means and said 2nd luminescence means, It is the graphic display device characterized by providing the optical diffusion means arranged in the optical outgoing radiation side of said light guide plate, and the liquid crystal display panel arranged at the optical outgoing radiation side of said optical diffusion means.

[0023] moreover, in the 1st time amount which other this inventions are the drive approaches of a graphic display device of having used the graphic display device of this invention, and is rewriting the screen of a liquid crystal display panel In the off process which makes an OFF state said 1st and 2nd luminescence means, and the 2nd time amount which is not rewriting the screen of a liquid crystal display panel It is the drive approach of the graphic display device which is equipped with the ON process which makes an ON state said 1st or 2nd luminescence

means, and is characterized by making said 1st luminescence means and said 2nd luminescence means turn on by turns in said ON process.

[0024] Moreover, other this inventions are graphic display devices characterized by providing the optical diffusion means arranged between the 1st liquid crystal display panel which has a stripe-like electrode, the 2nd liquid crystal display panel which displays an image, and said 1st liquid crystal display panel and said 2nd liquid crystal display panel.

[0025] Moreover, the 1st substrate with which other this inventions have a stripe-like electrode and the 2nd substrate which has a pixel electrode, The 1st liquid crystal layer which has the macromolecule pinched between the 3rd electrode which has the function of a counterelectrode, and the electrode of the shape of said stripe and said 3rd electrode, and a liquid crystal molecule, It is the liquid crystal display panel characterized by providing the 2nd liquid crystal layer pinched between said pixel electrode and said 3rd electrode.

[0026] Moreover, the 1st substrate with which other this inventions have a stripe-like electrode and the 2nd substrate which has a pixel electrode, The 1st liquid crystal layer which has the macromolecule pinched between the 3rd electrode which has the function of a counterelectrode, and the electrode of the shape of said stripe and said 3rd electrode, and a liquid crystal molecule, The 2nd liquid crystal layer pinched between said pixel electrode and said 3rd electrode, It is the graphic display device characterized by providing the back light arranged at said 1st substrate side, the 1st driver circuit which impresses a video signal to said pixel electrode, and the 2nd driver circuit which impresses driver voltage to the electrode of the shape of said stripe.

[0027] Moreover, other this inventions are the drive approaches of a graphic display device of having used the graphic display device of above-mentioned this invention, and after they rewrite the image of said 2nd liquid crystal layer, they are the drive approaches of the graphic display device characterized by having the process which impresses an electrical potential difference to the 1st liquid crystal layer corresponding to said part, and carries out incidence of the light of said back light to said 1st liquid crystal layer.

[0028] Moreover, other this inventions are lighting systems characterized by providing the light modulation layer pinched between the 1st substrate which has a matrix-like electrode, the 2nd substrate which has a common electrode, and the electrode of the shape of said matrix and said common electrode.

[0029] Moreover, other this inventions are above-mentioned this inventions characterized by said light modulation layer being a macromolecule distribution liquid crystal layer or TN liquid crystal layer.

[0030] Moreover, other this inventions are lighting systems which possess the light modulation layer pinched between the 1st substrate which has a stripe-like electrode, the 2nd substrate which has a common electrode, and the electrode of the shape of said matrix and said common electrode, and are characterized by the width of face of the electrode of the shape of said stripe being narrow in the center section, and being wide in the vertical section.

[0031] Moreover, what other this inventions possess the light modulation layer pinched between the 1st substrate which has a matrix-like electrode, the 2nd substrate which has a common electrode, and the electrode of the shape of said matrix and said common electrode, and the magnitude of the electrode of the shape of said matrix has in the center section of said 1st substrate is small, and the thing in a periphery is a lighting system characterized by the large thing.

[0032] Moreover, in the lighting system which has two or more lighting fields, other this inventions are two or more fields, and are lighting systems characterized by illuminating one liquid crystal display panel by making said lighting field turn on or switch off according to an individual.

[0033] Moreover, other this inventions are graphic display devices characterized by providing the lighting system which has the lighting field of the shape of two or more stripe, and the liquid crystal display panel which has the pixel line of 1 for the lighting field of the shape of said stripe, the same number, or an integer.

[0034] Moreover, other this inventions are the drive approaches of a graphic display device of having used the graphic display device of above-mentioned this invention, and are the drive approaches of the lighting system characterized by having the process which turns on the lighting field of the shape of odd-numbered stripe in the odd number field, and the process which turns on the lighting field of the shape of even-numbered stripe in the even number field.

[0035] Moreover, other this inventions are graphic display devices characterized by providing the liquid crystal display panel which has the image display field divided into two or more fields, and the lighting system which has the lighting field divided into two or more fields.

[0036] Moreover, other this inventions are the drive approaches of a graphic display device of having used the graphic display device of above-mentioned this invention, and are the drive approaches of the graphic display device characterized by having the process which turns on the lighting field located in the oddth in the 1st predetermined field, and the process which turns on the lighting field located in the eventh in said 1st field.

[0037] Moreover, other this inventions are the drive approaches of a graphic display device of having used the graphic display device of above-mentioned this invention, and are the drive approaches of the graphic display device characterized by having the process which changes said lighting area size actively with display-image data.

[0038] Moreover, other this inventions are the drive approaches of a graphic display device of having used the graphic display device of above-mentioned this invention, and are the drive approaches of the graphic display device characterized by having the process which generates two lighting fields at the same time of day.

[0039] Moreover, other this inventions are the drive approaches of a graphic display device of having used the graphic display device of above-mentioned this invention, and are the drive approaches of the graphic display device characterized by having the process which performs an image display condition and a whole surface black display

condition by turns.

[0040] Moreover, other this inventions are graphic display devices characterized by providing the liquid crystal layer pinched between the 1st substrate with which the pixel was formed in the shape of a matrix, the 2nd substrate with which the counterelectrode was formed, and said 1st substrate and said 2nd substrate, and an opposite signal impression means to impress the signal which makes the display screen a black display to said counterelectrode.

[0041] Moreover, other this inventions are graphic display devices characterized by providing the liquid crystal layer pinched between the 1st substrate with which the pixel was formed in the shape of a matrix, the 2nd substrate with which the counterelectrode of the shape of two or more stripe formed in the pixel line writing direction of said pixel was formed, and said 1st substrate and the 2nd substrate.

[0042] Moreover, other this inventions are graphic display devices characterized by providing the liquid crystal layer pinched between the 1st substrate which has the pixel electrode formed in the shape of a matrix, and two or more stripe-like electrodes formed in the pixel line writing direction of said pixel electrode, the 2nd substrate with which the counterelectrode was formed, and said 1st substrate and 2nd substrate.

[0043] Moreover, the pixel electrode with which other this inventions have been arranged in the shape of a matrix, and the 1st thin film transistor component which impresses a signal to said pixel electrode and the 2nd thin film transistor component, The source signal line arranged said pixel inter-electrode and the 1st gate signal line arranged said pixel inter-electrode, The source driver which impresses a video signal to the 2nd gate signal line and said source signal line arranged said pixel inter-electrode, The 1st gate driver which impresses an on-off electrical potential difference to the 1st gate signal line, The 2nd gate driver which impresses an on-off electrical potential difference to the 2nd gate signal line is provided. The gate terminal of said 1st thin film transistor component is connected to said 1st gate signal line. The source terminal of said 1st thin film transistor component is connected to said source signal line. The drain terminal of said 1st thin film transistor component is connected to said pixel electrode. The gate terminal of said 2nd thin film transistor component is connected to said 2nd gate signal line. It is the liquid crystal display panel characterized by connecting the source terminal of said 2nd thin film transistor component to said source signal line, and connecting the drain terminal of said 2nd thin film transistor component to said pixel electrode.

[0044] Moreover, other this inventions are the drive approaches of a graphic display panel of having used the liquid crystal display panel of above-mentioned this invention, and are the drive approaches of the liquid crystal display panel characterized by having the process which makes an ON state said 2nd thin film transistor component at the blanking period of a video signal, and the process which makes an ON state said 1st thin film transistor component at the data period of a video signal.

[0045] Moreover, the pixel electrode with which other this inventions have been arranged in the shape of a matrix, and the 1st thin film transistor component which impresses a signal to said pixel electrode and the 2nd thin film transistor component, The source signal line arranged said pixel inter-electrode and the 1st gate signal line arranged said pixel inter-electrode, The 2nd gate signal line arranged said pixel inter-electrode and the common signal line arranged said pixel inter-electrode, The source driver which impresses a video signal to said source signal line, and the reset driver which impresses a signal to said common signal line, The 1st gate driver which impresses an on-off electrical potential difference to said 1st gate signal line, The 2nd gate driver which impresses an on-off electrical potential difference to said 2nd gate signal line is provided. The gate terminal of said 1st thin film transistor component is connected to said 1st gate signal line. The source terminal of said 1st thin film transistor component is connected to said source signal line. The drain terminal of said 1st thin film transistor component is connected to said pixel electrode. The gate terminal of said 2nd thin film transistor component is connected to said 2nd gate signal line. It is the liquid crystal display panel characterized by connecting the source terminal of said 2nd thin film transistor component to said common signal line, and connecting the drain terminal of said 2nd thin film transistor component to said pixel electrode.

[0046] Moreover, the pixel electrode with which other this inventions have been arranged in the shape of a matrix, and the 1st thin film transistor component which impresses a signal to said pixel electrode and the 2nd thin film transistor component, The source signal line arranged said pixel inter-electrode and the 1st gate signal line arranged said pixel inter-electrode, The 2nd gate signal line arranged said pixel inter-electrode and the common signal line arranged said pixel inter-electrode, The 1st source driver which impresses a video signal to the 1st source signal line, The 2nd source driver which impresses a video signal to the 2nd source signal line, The reset driver which impresses a signal to a common signal line, and the 1st gate driver which impresses an on-off electrical potential difference to the 1st gate signal line, The 2nd gate driver which impresses an on-off electrical potential difference to the 2nd gate signal line is provided. The gate terminal of said 1st thin film transistor component is connected to said 1st gate signal line. The source terminal of said 1st thin film transistor component is connected to said 1st source signal line. The drain terminal of said 1st thin film transistor component is connected to said pixel electrode. The gate terminal of said 2nd thin film transistor component is connected to said 2nd gate signal line. It is the liquid crystal display panel characterized by connecting the source terminal of said 2nd thin film transistor component to said 2nd source signal line, and connecting the drain terminal of said 2nd thin film transistor component to said pixel electrode.

[0047] Moreover, average luminance of a screen in which a video signal has other this inventions, the maximum brightness, The 1st data-processing means which carries out adjustable [of the standup electrical potential difference and amplitude of a video signal which are impressed to a liquid crystal display panel based on at least one brightness data among the minimum brightness], It is the graphic display device characterized by providing the 2nd

data-processing means which said video signal has, and which carries out adjustable [of the electrical potential difference impressed to a lighting system based on at least one brightness data among the average luminance of a screen, the maximum brightness, and the minimum brightness].

[0048] Moreover, it is the array substrate which other this inventions possess a viewing area and the 1st and 2nd source DRAIPU circuits formed in the periphery of said viewing area with the polish recon technique, and said viewing area uses an amorphous silicon thin film as the semi-conductor film, and is characterized by forming the transistor component, and for a periphery using a polish recon thin film as the semi-conductor film, and forming the transistor component.

[0049] Moreover, other this inventions are viewfinders characterized by providing an optical generating means, an integrator lens, the polarization conversion means that carries out polarization conversion of the light from said optical generating means, a liquid crystal display panel, and the magnifying lens expand the display image of said liquid crystal display panel, and make it an observer catch sight of.

[0050] Moreover, other this inventions are video cameras characterized by providing the above-mentioned graphic display device and above-mentioned image pick-up means of this invention.

[0051] Moreover, other this inventions are graphic display devices characterized by providing the optical coupling material which carries out optical coupling of a liquid crystal display panel, a radii-like transparence member, said transparence member, and the display screen of said liquid crystal display panel.

[0052] Moreover, the 2nd substrate with which other this inventions have a reflector periodic as a lot for the 1st substrate and three pixels, The field where the liquid crystal layer *(ed) between the micro-lens array arranged in said 1st substrate side, and said 1st substrate and 2nd substrate was provided, and said micro-lens array of said 1st substrate has been arranged, It is the liquid crystal display panel characterized by the field in which said pixel of said 2nd substrate was formed having countered.

[0053] Moreover, it is the display characterized by for other this inventions possessing a liquid crystal display panel and the prism plate arranged at the optical plane of incidence of said liquid crystal display panel, and for said prism plate inclining to a predetermined include angle to the direction of a field of said liquid crystal panel, and the direction which intersects perpendicularly, and forming the air gap.

[0054] Moreover, other this inventions are lighting systems characterized by providing the 1st transparence block which has a parabolic reflector, the 2nd transparence block of the shape of a wedge arranged in the optical outgoing radiation side of said 1st transparence block, and the light emitting device arranged near the abbreviation focus of said transparence block.

[0055] Moreover, other this inventions are viewfinders characterized by providing the lighting system of above-mentioned this invention, a liquid crystal display panel, and the magnifying lens expand the display image of said liquid crystal display panel, and make it an observer catch sight of.

[0056] Moreover, other this inventions are viewfinders characterized by providing the 2nd transparence block of the shape of rust, and the display panel of the reflective mold arranged at the whole surface of said 1st transparence block please set and arrange few air gaps to a light emitting device, the 1st transparence block which has the ramp of the critical angle which carries out total reflection of the light from said light emitting device, and said ramp.

[0057] Moreover, after other this inventions' possessing the transparence block arranged at the optical plane of incidence of the display panel of a reflective mold, and said reflective type of display panel, and a light emitting device and carrying out total reflection of the light from said light emitting device in one aspect of said transparence block, it is the viewfinder characterized by carrying out incidence to said display panel.

[0058] Moreover, other this inventions are program documentation media characterized by reading being possible by computer which recorded the program and/or data for performing the function of all or a part of means [all or a part of] of the lighting systems of above-mentioned this invention by computer.

[0059] Moreover, other this inventions are program documentation media characterized by reading being possible by computer which recorded the program and/or data for performing the function of all or a part of means [all or a part of] of the graphic display devices of above-mentioned this invention by computer.

[0060] Moreover, other this inventions are program documentation media characterized by a readout being possible by computer which recorded the program and/or data for performing actuation of all or a part of processes [all or a part of] of the drive approaches of the graphic display device of above-mentioned this invention by computer.

[0061] Moreover, other this inventions are program documentation media characterized by a readout being possible by computer which recorded the program and/or data for performing actuation of all or a part of processes [all or a part of] of the drive approaches of the liquid crystal display panel of above-mentioned this invention by computer.

[0062] In order that the above lighting systems or indicating equipments of this invention may solve animation dotage etc., they take a synchronization for the timing which rewrites the electrical potential difference of each pixel of a display panel, and the drive circuit which drives a back light, and perform image display. A back light unit (lighting system) can be located in a line in parallel, and arranges two or more light guide plates.

[0063] White LED is attached in the edge of a light guide plate. 3-4 are constructed, and this white LED ** and carries out sequential lighting, or carries out sequential lighting one [at a time]. On the other hand, the location (the electrical potential difference of a pixel electrode is rewritten) impressed to each pixel line of a liquid crystal display panel is also scanned. This scan and lighting of white LED take a synchronization. Moreover, after the liquid crystal of the liquid crystal layer on the pixel which the electrical potential difference was impressed by the pixel and rewritten changes enough, it is made for fluorescence tubing to turn on LED of the light guide plate corresponding to the pixel line.

[0064] Thus, a synchronization is taken for the lighting timing of LED, and the timing of the electrical potential difference impressed to a liquid crystal display panel. That is, change of liquid crystal irradiates light from a back light only to the field which changed enough, and displays a pixel. On the other hand, the time amount which a pixel should display arises. For this reason, the display condition of CRT and the same display condition are realizable. Therefore, animation dotage is improved.

[0065]

[Embodiment of the Invention] In order that each drawing may make a plot easy easily [understanding] in this specification, there are an abbreviation or/and a part which carried out enlarging or contracting. For example, the cooling system (section) etc. is omitted in the projection mold display of (drawing 59). The above thing is the same also to the following drawings. Moreover, the part which attached the same number or the notation has a same or similar gestalt, an ingredient, a function, or actuation.

[0066] In addition, even if especially the contents explained with each drawing etc. do not have a notice, they can be combined with other examples etc. For example, the lighting system of (drawing 1) can be used for the display of (drawing 93), and the display which combined the display panel of (drawing 27) and the lighting-system equipment of (drawing 1) can be constituted. Moreover, the lighting system of (drawing 1) is also employable as the video camera of (drawing 91) etc. The PBS871 grade of (drawing 99) can also be added to the display of (drawing 100). That is, the matter explained on each drawing and specifications about the display panel of this invention document etc. can constitute the display of the operation gestalt combined mutually etc., without explaining according to an individual.

[0067] Thus, even if not illustrated especially in the specification, the matter indicated or explained in the specification and the drawing, contents, and a specification can be combined mutually, and can be indicated as a claim. It is because it is impossible to describe all combination on specifications etc.

[0068] Therefore, the matter explained by the liquid crystal display panel is applicable to a viewfinder or a projection mold display of this invention etc. Moreover, the matter explained with the lighting system is applicable to the display of the direct viewing type of all this inventions that use a lighting system, or a projection mold. Moreover, it cannot be overemphasized that the drive approach is applicable to each display panel and a display timely. Moreover, the light emitting device of this invention is used, and even if it is the viewfinder of a gap etc., it can constitute. Moreover, it cannot be overemphasized that the display panel manufactured using the manufacture approach of the display panel of this invention is employable as any display.

[0069] Hereafter, sequential explanation is given about the display of this invention etc., referring to a drawing etc. (Drawing 1) shows the top view of the lighting system 16 of this invention. A light guide plate (light guide section material) 14 consists of organic resin or glass substrates, such as acrylic resin and polycarbonate resin, etc.

[0070] When it sets the number of partitions to n (book) and the dip of the effective viewing area of a display panel 21 is set to H (cm), it is made to satisfy a degree type, since the number of a light guide plate has the need of generally divided and displaying the display screen on 8 or more ***** preferably at least 3 ***** although influenced by the magnitude of the display panel which is not illustrated directly arranged in drawing 1 in the optical outgoing radiation side of a back light 16.

[0071]

$5(\text{cm}) \leq H/n \leq 20 (\text{cm})$ (formula 1)

It is $8(\text{cm}) \leq H/n \leq 15$ still more preferably (cm). (formula 2)

It is made to satisfy *****.

[0072] In (drawing 1), although the light emitting device of white LED11 grade is arranged in the edge section of a light guide plate 14, it may not limit to this, and rod-like fluorescence tubing (not shown) may be arranged every light guide plate 14. Moreover, each light guide plate 14 may be made to turn on according to an individual using EL back light etc.

[0073] If H/n is too small, a light emitting device 11 or arc tubes will increase in number, and it will become high cost. On the other hand, if H/n is too large, a display screen will become dark, and animation dotage becomes is hard to be improved.

[0074] Moreover, when breadth of the effective viewing area of a display panel is set to W (cm), constituting so that a degree type may be satisfied is desirable.

[0075]

$0.07 \leq W/(H-n) \leq 0.5$ (formula 3)

It is desirable to satisfy a degree type still more preferably.

[0076]

$0.10 \leq W/(H-n) \leq 0.35$ (formula 4)

In addition, although 11 sets to LED etc. and 141 is used as the arc tube of the shape of a rod, such as fluorescence tubing, these may be reset mutually. For example, if LED11 is formed in the shape of an linear array, it will become fluorescence tubing, and if the rod-like arc tube 141 is shortened, it will become punctiform LED and approximation. That is, 11 is the punctiform light source and 141 is the rod-like light source. In addition, the light source may be made into the shape of a doughnut, and may be made disc-like. Moreover, you may be the surface light source, and outdoor daylight may be incorporated and light may be introduced into a light guide plate etc. The above thing to 11 and 141 are only properly used from the ease of explanation, and it may adopt whichever in fact.

[0077] Moreover, although the fluorescence tubing 141 has two, a hot cathode method and a cold cathode method, it is easy for the direction of a hot cathode method to modulate the light, and it is desirable. However, since there is

danger of a thermal run away, it is necessary to act as the monitor of the current which flows in fluorescence tubing continuously, and to control an overcurrent protection. Moreover, even if it is a cold cathode tube, modulated light becomes easy by enclosing into tubing what added 1 – 8% of hydrogen to the xenon. However, if hydrogen is put in, the inclination for lighting stage fright time amount to become late will come out. In that case, it is good to add 2 – 5% of argon gas.

[0078] White LED 11 is attached in the edge of a light guide plate 14 in (drawing 1). As for white LED, Nichia Chemical Industries, Ltd. is performing manufacture and sale. As white LED 11 is shown in the (drawing 123 (a)), the heat sink 805 is attached in the tooth back. This is because the effectiveness of white LED 11 is bad and generation of heat is large.

[0079] The amount of currents in which white LED will flow if the temperature of itself becomes high changes, and luminescence brightness changes. The heat sink 805 is effective as this cure. In addition, as for white LED 11, it is desirable to perform a constant current drive. Moreover, it is desirable to detect the temperature of white LED 11, and to constitute based on the detected data, so that the amount of currents which flows in white LED 11 may be controlled. Of course, LED11 may be turned on and off in the shape of a pulse.

[0080] Since the luminous efficiency of LED11 is bad, the great portion of injection power serves as heat. This heat is transmitted to the parabolic plate 805, and it is efficiently emitted in air and it radiates heat.

[0081] Since there is an irregular color / brightness nonuniformity in the light which carries out outgoing radiation from white LED 11, the diffusion sheet (diffusion plate) 171 is arranged or formed in an outgoing radiation side. The resin plate or opal glass containing diffusion particles in which the diffusion plate 171 carried out frosting processing, such as a glass plate and titanium, corresponds. Moreover, the diffusion sheet 171 (lighting series) which KIMOTO, Inc. has put on the market may be used.

[0082] Since an irregular color is lost with the diffusion plate 171 and the area of the diffusion plate 171 serves as a luminescence field, luminescence area can be freely set up by changing the magnitude of the diffusion plate 171. If a luminescence field is enlarged with the diffusion plate 171, although brightness falls, it can illuminate light guide plate 14 grade to homogeneity. Brightness becomes high, although unevenness will occur somewhat if a luminescence field is made small. (Drawing 123 (b)) What may be adhesives 72a which added the dispersing agent in resin besides a tabular thing, in addition carried out the laminating of the fluorescent substance thickly is sufficient as the diffusion plate 171 (reference). A fluorescent substance is because light-scattering nature is high. Moreover, optical pumping may be carried out with a fluorescent substance, and a color shift may be carried out. It is called the diffusion plate 171 including these. Since directivity can illuminate the diffusion section to homogeneity to breadth and the periphery of a viewing area hemispherical or by forming in the shape of a cylinder, it is desirable.

[0083] It is important to arrange, since an irregular color will arise in a display image, if this diffusion plate 171 (diffusion sheet) does not exist. Moreover, as for the color temperature of white LED, it is desirable to use the following [9000 (K)] more than 6500K (K). Moreover, as shown in the (drawing 123 (b)), adhesives 72a containing a dispersing agent functions as optical coupling material (optical coupling).

[0084] Moreover, the color temperature of the luminescent color is improvable by arranging or forming a color filter 1231 in the optical outgoing radiation side of white LED 11. When especially the light emitting device 11 is white LED, there is a band out of which the light of a strong peak comes blue, and this peak has large variation for every LED. Therefore, the color temperature variation of the display image of a display panel 21 becomes large.

[0085] By arranging a color filter 1231, variation in the color temperature of a display image can be lessened. When using white LED especially as a light emitting device 11, since there are many rates of blue glow, in accordance with the color of the color filter of a display panel 21, it is coped with preponderantly. Moreover, the light emitted from LED11 is efficient, and the reflective film 51 is formed in the base of LED11 etc. so that it may emanate to a front face. The light emitted to the rear face is also reflected in a front face by this reflective film 51. Ag is used as reflective film 51.

[0086] Between a light guide plate 14 and LED11, the optical coupling material (optical coupling material) 126 is applied or arranged so that incidence of the light emitted from white LED 11 may be efficiently carried out to a light guide plate 14. Solid-states, such as gels, such as liquids, such as pure water, alcohol, a SARUCHIRUSAN methyl solution, and ethylene glycol, and silicon resin, an epoxy resin, phenol resin, and poly vinyl alcohol (PVA), are illustrated, and, as for the optical coupling material 126, the thing of or more 1.44 1.55 or less range is illustrated mainly for a refractive index.

[0087] In addition, not using color filter 1231 grade, ** can also perform color temperature adjustment or reduction of color nonuniformity by making dispersing agents, such as impalpable powder of Ti, or a color, and a pigment coating contain in the optical coupling material 126. Moreover, anything of an absorption mold and an interference pattern (dielectric multilayers) can use a color filter 1231.

[0088] White LED 11 can be transposed to LED of other single colors or a compound color. For example, it is LED11B of LED11G or (Blue B) color luminescence of LED11R of (Red R) color luminescence, and green (G) color luminescence. If LED of such a color is used, with a natural thing, the luminescent color of a lighting system turns into a single color etc., and a white display cannot be realized. However, when the display panel used with a lighting system is monochrome, as a practical application, it is enough. Of course, you may make it white luminescence by combining 11R, 11G, and 11B. even if it turns these on to coincidence — the field — the light may be made to switch on sequentially

[0089] Moreover, OPUTONIKUSU etc. can transpose white LED 11 to the firefly luminescence lamp of Luna series currently manufactured and sold. That is, anything of not the thing to limit to LED but 11 is good at the light

emitting device which can do *****. For example, a tungsten lamp, a krypton lamp, etc. may be used. Moreover, outdoor daylight may be condensed or an EL element may be used.

[0090] In addition, the contents explained in (drawing 123) are effective also in the example of this invention. for example, (drawing 98) (drawing 93) -- (drawing 92) (drawing 90) etc. -- a display is illustrated. Thus, the matter indicated on these specifications may be combined and used in the various examples.

[0091] Moreover, as shown in (drawing 13), white LED 11 may be constituted as one like LED array 12. moreover, the optical outgoing radiation side of LED11 -- a minute convex lens may be formed in arrangement or the optical outgoing radiation side of LED. In this case, the light emitted from the luminescence chip of LED11 is efficiently inputted into a light guide plate 14.

[0092] In addition, although the light guide plate 14 was used as the plate in the example of (drawing 1), the configuration of not limiting to this and having piled up two or more sheets or plates for example, may be used. Moreover, what hardened many optical fibers 71 with adhesives 72, and was made into one as shown in (drawing 7) may be used. The light emitted from LED11 is inputted into a fiber 71. The inside of a fiber 71 is spread by light to the shape of a straight line, i.e., the longitudinal direction of (drawing 1).

[0093] In addition, a liquid etc. is sufficient as adhesives 72, and they may add a light absorption object in adhesives 72. Moreover, you may form with a metal etc. Moreover, not using adhesives, ***** is sufficient in the clad of a fiber 72. In addition, glass or the wire rod of resin, a bead, etc. can be used instead of an optical fiber. In addition, a plate with a refractive-index anisotropy, a sheet, a prism plate, etc. may be used. That is, as long as light is often transmitted to a longitudinal direction rather than a lengthwise direction, what kind of thing may be used. Moreover, scattered reflection of the reflective film may be formed and carried out to a light guide plate, and you may constitute so that a longitudinal direction may be made to spread light. Moreover, two or more holes may be made in a rear face, and you may constitute so that it may illuminate to homogeneity. Moreover, what combined the minute stripe-like plate may be used.

[0094] Although [(drawing 7)] fiber 72 grade is collectively formed in the oblong-like light guide plate 14, you may be tabular [it does not limit to this and 14a-14e of (drawing 1) were united with]. Moreover, embossing may be performed, detailed ** and a hole may be formed, or a minute mirror or an optical dispersing agent may be arranged or formed in the front face of a light guide plate 14 etc. Moreover, into a light guide plate, an optical dispersing agent may be added or the add-in material for color correction may be added.

[0095] In (drawing 1), the light 18 emitted from the light emitting device 11 is reflected and transmitted with the reflecting plate 15 (a reflective sheet or a reflective member, reflective film) arranged between light guide plates 14. A reflecting plate 15 is formed in the side face and rear face of a light guide plate 14.

[0096] The light 18 emitted from the light emitting device 11 illuminates the inside of each light guide plate 14. Therefore, if light emitting devices 11a and 11f light up, only light guide plate 14a will become a lighting object. That is, it means arranging an oblong lighting object (14) to two or more juxtaposition by adopting the configuration of (drawing 1). And if sequential lighting of LED11 is carried out, what is made to switch on the light or put out the light one by one with light guide plate 14a->14b->14c->14d->14e->14a (scan) will be made. In addition, scan sequence may not be limited to an one direction, may carry out sequential lighting from a top by the 1st frame, and may be made to turn on from the bottom with the 2nd following frame.

[0097] A reflecting plate 15 uses film-like a thing or a tabular thing. In order for these to vapor-deposit metal thin films, such as aluminum (aluminum), silver (Ag), titanium (Ti), and gold (Au), on a sheet or a plate and to prevent oxidation of a metal thin film, the vacuum evaporation film which consists of inorganic materials, such as SiO₂, is formed in the front face of a metal thin film. Moreover, you may laminate. Moreover, the coating which is glossy as a reflecting plate 15 may be used. In addition, the dielectric mirror which consists of dielectric multilayers may be adopted. Moreover, what cut the metal plate which consists of aluminum etc. may be used.

[0098] However, this reflecting plate 15 may not be limited to what reflects light, and the thing of the property which carries out optical diffusion of the front face may be used. For example, what applied impalpable powder, such as opal glass, the sheet which applied the impalpable powder of Oxidization Ti (titanium), or a plate is illustrated. Moreover, an optical dispersing agent may be applied to the perimeter of a reflecting plate 15. Reflecting plate 15 self may be formed with an optical diffusion ingredient, or the front face of a reflecting plate 15 may be oxidized, and an oxidation alumina may be formed (production).

[0099] (drawing 2) -- a part of (drawing 1) -- it is a cross section. In (drawing 2), it is the example which carried out cutting of the plate which consists of a metal, formed the crevice 24, and formed in this crevice 24 the reflective film 15 which consists of aluminum etc. The light guide plate 14 is inserted in this crevice 24. Moreover, a liquid or gel is poured into a crevice 24, and it remains as it is, and is good also as a light guide plate by making it use or harden.

[0100] The prism sheet 23 is arranged in the optical outgoing radiation side of a light guide plate 14. A prism sheet has the function which strengthens luminous intensity which carries out outgoing radiation from a light guide plate 14. That is, directivity is narrowed. The three em company etc. is manufacturing and selling the prism sheet 23.

[0101] Moreover, the diffusion sheet 22 is arranged in the optical outgoing radiation side of the prism plate 23. The irregularity of the prism plate 23 penetrates a display panel 21, and it is made for a diffusion sheet not to appear. As this diffusion sheet 22, KIMOTO is manufacturing and selling as lighting series. In addition, the pitch of the irregularity of prism 23 is set to 1mm or less 0.2mm or more.

[0102] The concentricity of light is high near the light emitting device 11. Therefore, the brightness near the light emitting device 11 becomes high, and serves as display nonuniformity. For this cure, with the lighting system of this

invention, as shown in (drawing 3), the optical diffusion section 31 is formed or arranged near the light emitting device 3.

[0103] The optical diffusion section 31 consists of circular or a square optical diffusion dot 41, as shown in (drawing 4) . The optical diffusion dot 41 is formed on the diffusion sheet 22 arranged directly or independently on the front face of a light guide plate 14 etc.

[0104] The optical diffusion section 31 is formed or arranged on the sheet 22 arranged between the front face of a light guide plate 14 or a display panel 21, and a light guide plate 14. The optical diffusion section 31 has the function to decrease the light which diffuses an original light and reaches a display panel 21. In addition, what decreases the light which shades direct light by a metal membrane etc. and reaches a display panel 21 is contained. That is, extinction may adjust brightness nonuniformity.

[0105] The optical diffusion section 31 forms near LED11 greatly a circle or in the shape of radii, as shown in (drawing 3), and it forms the location distant from LED11 small. Moreover, the configuration of reducing light transmission or the rate of optical rectilinear propagation over the whole like smoked glass is sufficient as the optical diffusion section 31. It is large and a distant place makes small a place with the optical diffusion dot 41 near LED11. Thus, by forming the optical diffusion section 31, the illumination light of a back light 16 serves as homogeneity over all fields.

[0106] Increasing near the light emitting device 11, a center section decreases. Since this technical problem is coped with, as shown in (drawing 5), by this invention, the optical diffusion member (optical diffusion dot) 51 is formed in the front face of a light guide plate 14. In addition, the optical diffusion member 51 may shade, as (drawing 4) also explained (reflective film).

[0107] In the example of (drawing 5 (a)), the punctiform optical diffusion member is formed or arranged in the light guide plate 14 grade. Enlarging area of the optical diffusion member of the center section of the light guide plate 14, a periphery (near LED) makes area small. In addition, when 51 is the reflective film, it considers as this reverse. Moreover, as shown in (drawing 5 (b)), the optical diffusion member 51 is good also as the shape of a stripe. Enlarging area of the optical diffusion member of the center section of the light guide plate 14 also in this case, a periphery (near LED) makes area small. When 51 is the reflective film similarly, it carries out to moreover (drawing 5 (a)) with this reverse. Moreover, LED may be formed in a plane or luminance distribution which does not look visual may be given. Moreover, a light-shielding film or the reflective film may be formed in the LED itself. Moreover, thickness distribution may be given to the fluorescent substance applied to LED.

[0108] (Drawing 6 (a)) is not giving the reflex function to a reflecting plate 15. It uses as a case holding a mere light guide plate 14 and a mere light guide plate 14. The reflective film 61 vapor-deposits aluminum, Ag, etc. at the side face and rear face of a light guide plate 14, and is formed in them (reflective film 51). The reflective film 61 is directly formed in a light guide plate 14, and also it may stick on a light guide plate 14 aluminum (aluminum) or the reflective sheet which vapor-deposited silver (Ag). Moreover, you may arrange between a light guide plate 14 and a case 15. The three em company sells such a reflective sheet by brand name called silver Lux.

[0109] (Drawing 6 (b)) is the configuration which made hollow the interior of a light guide plate 14 (centrum 62). Thus, a lighting system can be lightweight-ized by making hollow the interior of a light guide plate 14. In addition, a liquid or gel may be inserted in a centrum. Water or ethylene glucosol is illustrated as these liquids or gel. Since specific gravity is smaller than resin, as for a liquid or gel, lightweight-ization of a lighting system can be attained like the point. Of course, a centrum 62 may be filled up with ultraviolet-rays hardening resin etc. Moreover, an optical dispersing agent etc. may be added to a centrum 62, or it may be filled up with an optical dispersing agent. The coloring matter which absorbs light may be added.

[0110] In addition, the sodium hydroxide etc. is added to the water or gel inserted in a center section 62, and PH is made or less [10.5 or more] into 12.5 still more preferably 13 or less [10 or more]. Thus, even if these liquids leak and come out by what the water or gel to insert is made into alkalinity for, oxidizing the reflective film 61 etc. decreases and it is stable. What is necessary is just to add a sodium hydroxide etc. in water or gel, in order to make it alkalinity.

[0111] Moreover (drawing 6), it sets, and a case 14 is formed with a glass ingredient, and also it may be formed with acrylic resin and polycarbonate resin. In addition, acrylic and UV resin may be stiffened and you may form.

[0112] In addition, in the lighting system 16 of this invention, it is desirable to form a reflecting plate or a light absorption member in addition to an effective optical outgoing radiation field (invalid field). Moreover, 14 may be used as a liquid crystal layer and an optical outgoing radiation condition or an optical diffusion condition may be changed with applied voltage.

[0113] (Drawing 1) etc. -- a display without animation dotage can be constituted by combining the lighting system and display panel 21 of this invention which are shown.

[0114] It is explained that a display panel 21 uses the liquid crystal display panel in OCB mode (Optically compensated Bend Mode) in order to give explanation easy. However, liquid crystal display panels, such as other TN modes, can also be used. For example, it cannot be overemphasized that the OCB mode of a high-speed response, high-speed TN liquid crystal of Merck Co. or the ASV mode that Sharp proposes, a ferroelectric liquid crystal, antiferroelectricity liquid crystal, etc. may be used.

[0115] Furthermore, it cannot be overemphasized that macromolecule distribution liquid crystal (PDLC, PNLC, N-CAP), ECB (Electrically Controlled Birefringence) mode, perpendicular orientation (VA:VerticallyAligned) mode, EOC (Electrically-induced Optical Compensation) mode, IPS mode, STN LCD, DAP mode, ASM (Axial Symmetric Micro-Cell) mode, etc. can be used. In addition, the guest host liquid crystal which added dichroic coloring matter to

cholesteric nematic phase transition mold liquid crystal is sufficient as what was compounded.

[0116] When the light modulation layer 226 of a display panel 21 is in OCB mode, it is necessary to impress the electrical potential difference of the shape of a rectangle or a sine wave at the time immediately after powering on. As for the magnitude of an electrical potential difference, it is desirable that it takes more than ≈ 5 (V) below for ≈ 15 (V). Moreover, as for the frequency of an electrical potential difference, it is desirable that it takes more than 40 (Hz) below for 100 (Hz).

[0117] Sequential lighting of the light emitting device 11 is carried out, and a lighting system (carrying out sequential putting out lights) 16 is driven. In (drawing 8), 81 is the section (light guide plate 14 section whose light emitting device 11 is not in a lighting condition) non-switching on the light, and 82 is the lighting section (light guide plate 14 section whose light emitting device 11 is in a lighting condition).

[0118] As for the relation between the area S1 of the section 81 non-switching on the light, and the area S2 of the lighting section 82, in one lighting system, it is desirable to satisfy the relation of a degree type.

[0119]

$$0.075 \leq S2/S1 \leq 1.6 \text{ (formula 5)}$$

It is desirable to satisfy the relation of a degree type still more preferably.

[0120]

$$0.1 \leq S2/S1 \leq 0.8 \text{ (formula 6)}$$

Animation dotage becomes small and can realize good animation display, so that the value of S2/S1 is small.

However, if smaller than 0.075, a screen will become dark too much. On the other hand, animation dotage becomes large, so that the value of S2/S1 is large.

[0121] As shown in (drawing 8), the sequential migration of the location of the lighting section 82 is turned down from on a screen. It is made to synchronize with this migration and the image display of a display panel is changed. Moreover, lighting of a back light is performed in consideration of the responsibility of liquid crystal. That is, after liquid crystal fully becomes a target and transmission, the back light of the location is made to turn on.

[0122] If the environment (interior of a room) where a display panel is generally seen is bright, it is necessary to make the display screen bright. The lighting number of a light emitting device 11 is made to increase in that case. Brightly [a display screen], when bright in the interior of a room, animation dotage cannot be easily visible. On the other hand, an observer's eye will be attached, if an environment (interior of a room) is dark and the brightness of the display screen will not be reduced. The lighting number of a light emitting device 11 is decreased in that case. Animation dotage can tend to be seen when [dark in a display screen and] dark in the interior of a room. Since the period when a black indication of the display screen is given becomes long by decreasing the lighting number, animation dotage is improved.

[0123] Thus, it carries out manually using the remote controller which a user can use for changing the lighting number of a light emitting device 11 freely, or a transfer switch, and also the reinforcement of outdoor daylight (ambient light) may be detected automatically by the phot sensor (not shown), and this detection result may perform automatically. As a phot sensor, PIN photo diode, a photo transistor, and CdS are illustrated.

[0124] When outdoor daylight is bright, many LED11 is turned on and a screen is made bright. It is the reverse when outdoor daylight is dark. moreover, according to the class (a still picture, an animation, movie) of display image, it is manual -- it is -- you may make it change automatically

[0125] The following explains especially paying attention to the lighting section 82. The scan of the lighting section is performed in the direction of bottom-of-screen D from the screen upper part U so that it may understand also by (b) ->(c) ->(d) -> (a) of (drawing 8). Drawing which looked at this condition from the longitudinal direction is (drawing 9). Moreover, in (drawing 9), it is the range which the observer can see as an image at time of day (time amount) with the range of A.

[0126] Liquid crystal layer 23b of a display panel 21 has period predetermined permeability of one frame with the electrical potential difference written in a pixel. Therefore, if the whole back light 16 is emitting light, it will become the front area area A (field the image is showing) of a display panel 21. However, in order to turn on only a part in the time of day which is the back light of this invention, area A serves as limited range.

[0127] The liquid crystal display panel 21 redraws image data for every pixel line. In (drawing 9), S shows the point (Rhine, i.e., a pixel line) which is writing the image in the display panel 9. When a display panel 21 is a liquid crystal display panel as writing in an image, the electrical potential difference (ON state voltage) which makes the gate signal line of applicable Rhine turn on the thin film transistor 241 (TFT) as a switching element is impressed, and it means that an electrical potential difference is written in the pixel connected to this gate signal line. The written-in electrical potential difference is held until it is written in a degree (one frame or 1 field).

[0128] Even if, as for liquid crystal, an electrical potential difference is impressed to a pixel on a pixel, it does not become target permeability immediately. Liquid crystal starts in TN liquid crystal, and time amount is about 25 to 40 msec. In OCB mode, it is 2 - 5msec. It is not desirable that the condition that it is changing since time amount is in this condition (it is henceforth called a permeability change condition) that permeability is changing is in sight of the observer (user) of a display by starting. Moreover, if the condition that transmission is changing is in sight, it will become the cause of animation dotage.

[0129] In this invention, the part of this transmission change condition switches off a back light. A back light is made to turn on in the part in the condition (henceforth, transmission goal state) that transmission turned into target transmission completely on the other hand. Therefore, animation dotage etc. does not occur but good image display can be realized. moreover, the thing with animation dotage being improved [much] also to the approach of making it

display it as an image display → black display → image display → black display which it is alike and has been contributed cannot be overemphasized.

[0130] In the condition of (drawing 9 (a)), the back light of the range below [A] the point S that the image is written in is on so that clearly [(drawing 9)]. Since the part of this A is just before an electrical potential difference is written in, after an electrical potential difference is impressed to a pixel, sufficient time amount has passed. Therefore, the part of A is a permeability goal state.

[0131] Henceforth, →(drawing 9 (a)) (drawing 9 (b)) →(drawing 9 (c)) →(drawing 9 (d)) →(drawing 9 (a)) →(drawing 9 (b)) profit Rika food ****. After an electrical potential difference is impressed to a pixel and sufficient period passes, the back light 14 of the field of A turns all on. Therefore, a good image can be displayed.

[0132] In addition, although carried out to making the back light of the part immediately under Point S turn on in (drawing 9) (part of A), it does not limit to this. The part of A means that liquid crystal etc. makes the light switch on in the state of [the / similar] a permeability goal state. Therefore, which location may be used, as long as it is after impressing an electrical potential difference to a pixel and carrying out predetermined time progress. Moreover, the part of A does not need to be continuing completely and may be divided into two or more parts. Moreover, the part of A does not need to be continuing completely and predetermined distance may consist of two or more parts which got used. Moreover, no parts other than A may completely be in a putting-out-lights condition. For example, 10% etc. is sufficient as permeability.

[0133] The lighting period of the part of A of a back light and the period (rewriting period) which rewrites the screen of a display panel 21 are made in agreement. Usually, in the case of a liquid crystal display panel, a period is 50Hz or 60Hz. However, if it is 50Hz – 60Hz, the display screen may be in a flicker condition. As for a rewriting period, at this time, it is desirable to be referred to as 70Hz or more 180Hz or less. It is desirable to be referred to as 80Hz or more 150Hz or less especially. In order to realize this period, the image data impressed to a liquid crystal display panel are digitized, and memory is made to memorize them once. And time-axis conversion is performed and an image is expressed as a target rewriting period.

[0134] Thus, it is thought of for one half of the frequencies of a rewriting period to appear by the different directive property in the condition of having impressed the condition of having impressed the forward electrical potential difference to the liquid crystal of a liquid crystal display panel, and the negative electrical potential difference, or the gap with the lighting synchronization of a back light, and the rewriting synchronization of the liquid crystal display panel 21 that a flicker occurs. That is, if a rewriting period is 50Hz and it is 25Hz and 60Hz, a 30Hz component will appear. What measured this relation is shown in (drawing 11). The graph of (drawing 11) makes the axis of abscissa the frequency f. This frequency is made into one half of the frequencies of a rewriting period. The axis of ordinate is made into the flicker luminous coefficient A_n when seeing a display panel 21.

[0135] That is, the graph of (drawing 11) shows the time of changing these periods (twice of a frequency f), after rewriting with the lighting period and making a period in agreement. The time of a flicker being most sensed large is standardized to 1.0.

[0136] It is sensed from the graph of (drawing 11) at the time of 10Hz (a rewriting period is 20Hz) that a flicker is the largest. However, a flicker decreases rapidly in about 30Hz. It stops sensing a flicker mostly in 40Hz. As for the rewriting period of a display panel, it is preferably more desirable than this result to be referred to as 80Hz or more 70Hz or more. It is perfect if referred to as 90Hz or more.

[0137] A maximum frequency is influenced by the processing speed of the drive circuit of a display panel. 180Hz (three X) of 3 60Hz times is a limitation on a technique. Cost becomes high — high-speed passive circuit elements are needed — although 4X beyond it cannot be realized on NTSC or VGA level. Probably, it should consider as 150Hz or less of 75Hz twice preferably. If low cost-ization is furthermore desired, it should consider as 100Hz of twice (50 or 60Hz), or 120Hz or less. Moreover, the twice of a drive usual [the ease of circuitry to] are desirable. That is, it will be set to $50\text{Hz} \times 2 = 100\text{Hz}$, $60\text{Hz} \times 2 = 120\text{Hz}$, or $75\text{Hz} \times 2 = 150\text{Hz}$ in many cases. From this, the rewriting rate of a display panel should usually be made the twice [at the time (at the time of the former)] as many frequency as this.

[0138] (Drawing 10) is the explanatory view of the drive circuit of the display of this invention. The gate driver 101 which impresses ON state voltage to a gate signal line one by one, and the source driver 102 which impresses a video signal to a source signal line are loaded into the display panel 21. This driver 101,102 is controlled by the driver controller 103. That is, the rewriting period of a display panel 21 is controlled by this driver controller 103.

[0139] On the other hand, LED array 12 attached in the edge of a back light 16 is connected to the LED driver 104. The LED driver 104 is controlled by the back light controller 105. Therefore, the lighting period of a back light is controlled by the back light controller 105.

[0140] The back light controller 105 and the driver controller 103 take a synchronization by the video-signal processing circuit 106, and are controlled. Therefore, a rewriting period and a lighting period are synchronized.

[0141] By synchronizing as mentioned above, a good image without animation dotage is displayed on the image display field 107 of a display panel 21. However, an image may be a still picture. For example, the display panel of a personal computer mainly displays a still picture. If the above-mentioned drive approach is enforced in the case of a still picture, the Rhine flicker will be displayed as the damage. The Rhine flicker generated with a still picture degrades image quality. It is because it is hard coming to see on a screen.

[0142] When displaying a still picture (for example, when using the indicating equipment of this invention as a monitor of a personal computer), the back light controller 105 is controlled and it is made a still picture display mode.

[0143] This still picture display mode is the approach of performing a rewriting period and a lighting period which were explained by (drawing 9), without taking a synchronization. Of course, although it is very good in a synchronization, the lighting period of a back light 16 is doubled [more than] as compared with the period which rewrites a display panel 21. However, they may be 6 or more times. Generally the lighting period of LED is rewritten and it is made quicker than a period. It takes preferably for 12 or less times of a rewriting period 1.5 or more times. It takes still more preferably for 6 or less times more than twice.

[0144] Under the present circumstances, the rate of the lighting section 82 at the time of the animation display explained by (drawing 8) and the section 81 non-switching on the light is made the same. When it was made to change and switches to a still picture display mode from animation display mode, it is for the brightness of a screen to change. However, when the lighting period of LED is changed, it is desirable to prepare the user switch or user BORIUMU which makes the amount of force current to LED tune finely by the time amount which lighting of LED takes, since the brightness of a screen may change. Moreover, the brightness change when switching to a still picture display mode is beforehand measured from animation display mode, and when a display mode is switched, you may constitute so that it can set up automatically. These are easily realizable with the microcomputer software built in a display.

[0145] If a lighting period is made quick, it will not be recognized from an observer that the back light 16 is carrying out flashing actuation. And since the rewriting period of the display screen and the synchronization are not taken, there is no generating of the Rhine flicker. If an animation is displayed in this condition, naturally animation dotage etc. will occur. However, since it is the display of a still picture, it is satisfactory. Moreover, in a synchronization, at all, if the flashing period of a back light is made into a high speed, vision (consciousness) of the generating of a flicker will not be carried out.

[0146] As for the still picture display mode previously explained to be animation display mode like (drawing 9), it is desirable to constitute so that it can switch with the user switch 108. moreover, the thing for which inter-frame image data is calculated — an animation display condition or a still picture display condition — or it may judge automatically that it is more suitable that it is more suitable whether to make it animation display condition mode and whether to make it still picture display condition mode, and you may constitute so that a microcomputer (not shown) etc. may switch a switch 108. Detection of being a movie display is established as ID techniques (animation field detection technique), such as extended definition television television.

[0147] Moreover, when not using a display beyond fixed time amount, you may set up so that screen intensity may be reduced. What is necessary is just to lessen area of the lighting section 82 shown in (drawing 8), in order to reduce screen intensity. This is easily realizable by decreasing the lighting number of a light emitting device 11. This control is also easily realizable by using the timer circuit of a microcomputer. Moreover, it is desirable, when not carrying out fixed period use of the personal computer which connected the display panel, and the power source of a back light 16 is turned off automatically or it is made to dim.

[0148] The example of (drawing 1) attached the light emitting device 11 in the both ends of a light guide plate 14. However, as shown in (drawing 12) instead of what is limited to this configuration, a light emitting device 11 may be arranged at one end of a light guide plate 14. In this case, it is mutually good for the opposite side of a light guide plate 14 like relation (11a and 11d of (drawing 12)) to arrange a light emitting device 11. It is for controlling generating of the luminance distribution of right and left of a lighting system 16.

[0149] With the configuration of (drawing 12), $\lambda/4$ plate ($\lambda/4$ film) 121 is attached in the opposite end of the light guide plate 14 with which the light emitting device 11 is not attached. Moreover, reflective film 51b is formed or arranged in the rear face of $\lambda/4$ plate. λ of $\lambda/4$ is the dominant wavelength (nm) or on-the-strength core wavelength (nm) which a light emitting device 11 generates. For example, it is $\lambda = 550\text{nm}$. Therefore, the film which has the phase contrast of the abbreviation $1/4$ for the wavelength λ of a chief ray or the phase contrast of the near is meant in $\lambda/4$.

[0150] It is reflected by reflective film 51b, and outgoing radiation of the light which carried out incidence to $\lambda/4$ plate 121 is again carried out from $\lambda/4$ plate, and it carries out incidence to a light guide plate 14. Under the present circumstances, rotation of the phase of incident light is carried out 90 degrees (DEG.). That is, P polarization changes to S polarization and S polarization changes to P polarization. Moreover, the polarizing plate used for a display panel may use a reflective type thing. This type reflects the polarization component which is not penetrated.

[0151] When using the display panel of a polarization method for the front face of the lighting system of this invention, only one polarization of P polarization or S polarization is used. By arranging $\lambda/4$ plate 121 made to rotate polarization like (drawing 12), the role of the polarization component which penetrates a display panel 21 increases. Therefore, a daylight display is realizable. A part of polarization component which does not pass the polarizing plate of a display panel is reflected, and this is considered for returning again in a light guide plate 14.

[0152] Of course, although explained later, the polarization beam splitter (henceforth referred to as PBS) 871 as shown in (drawing 99) may be arranged to the optical outgoing radiation side of a light emitting device 11. Only one polarization component of P polarization or S polarization carries out incidence to a light guide plate 14, $\lambda/4$ plate 121 acts each other, efficiency for light utilization improves, and image display becomes good.

[0153] The white (light emitting diode) LED 11 as a light emitting device 11 sells that by which Nichia Chemical Industries, Ltd. applied the fluorescent substance of a YAG (yttrium aluminum garnet) system to the chip front face of GaN system blue LED. In addition, Sumitomo Electric engineering is developing the white LED which prepared the layer which emits light in yellow in the component of blue LED manufactured using the ZnSe ingredient.

[0154] in addition, not the thing limited to white LED as a light emitting device but the field — what is necessary is just to use one or more LED for LED of R, G, and B luminescence, when displaying an image sequentially moreover, LED of R, G, and B is arranged to high density or juxtaposition, and these three LED is synchronized with the display of a display panel — making — the field — the configuration made to turn on sequentially may be used. In this case, it is desirable to arrange an optical diffusion plate to the optical outgoing radiation side of LED. Generating of color nonuniformity is lost by crawling on an optical diffusion plate and being located. Moreover, LED of R, G, and B in three primary colors is made to emit light to coincidence, and the white light may be formed.

[0155] what is limited to this although the above example was the configuration of having the reflecting plate (or gobo 15) which divides between light guide plates 14 — it is not (drawing 13) — the thing using the light guide plate 14 of one sheet may be used so that it may be shown. Of course, it cannot be overemphasized that the protection-from-light section 15 may be formed.

[0156] It sets to (drawing 13), and LED array 12 is arranged or formed in the both ends of a light guide plate 14. As for LED array 12, the LED component is formed in the shape of continuation. As for this LED component, a lighting location is scanned by the LED driver. The lighting section A moves in the direction of an arrow head smoothly by this scan. This configuration can also realize the method of presentation of (drawing 9). However, in (drawing 13), since there is no reflecting plate 15, about 12 LED component is surely bright, and a center section becomes dark.

[0157] Since this technical problem is coped with, the optical diffusion dot 41 shown in (drawing 4) is formed or arranged, and as shown in (drawing 5), the center section of the light guide plate 14 and a periphery are changed in the area of the reflective film 51 or an optical diffusion member.

[0158] In addition, in (drawing 13), if LED11 is made into two or more groups and the light is switched on, the drive approach of the same back light 16 as (drawing 1) is realizable. Moreover, as (drawing 13) explained, each LED11 is scanned sequentially, if the approach of showing this scan period for taking the image rewriting period of a display panel 21 and a synchronization (drawing 9) is adopted, vision of the break of lighting of a light guide plate 14 is not carried out, but it can realize good image display. Moreover, LED array 12 is not limited to white and LED of R, G, and B could be formed in the shape of an array. In addition, the color filter of R, G, and B could be added to the white light emitting device.

[0159] Although the above example illuminates a light guide plate using white LE 11, it cannot limit to this, and as shown in (drawing 16), the rod-like fluorescence tubing 141 can also be adopted. In addition, the minute fluorescent lamp of Northeast Electron, the fluorescent lamp of the Luna series of OPUTONIKUSU, Inc., the firefly luminescence component of Futaba Electron or the neon tube of Matsushita Electric Works, Ltd., etc. may be used as a light emitting device 11. In addition, the light from discharge lamps, such as a metal halide lamp and a halogen lamp, is drawn with an optical fiber, and it is good also considering this as a light emitting device (section), and good also considering outdoor daylight, such as sunlight, as a light emitting device (section).

[0160] In (drawing 16 (a)), it is the example of a configuration which used two fluorescence tubing 141. The fluorescence tubing 141a and 141b is made to turn on by turns. (Drawing 14 (b)) is the example of a configuration which used four fluorescence tubing 141. Sequential lighting of the fluorescent lamp as a light emitting device 11 is carried out with 141a→141b→141c→141d→141a→. Moreover, the light is made to switch on by turns in the group of 141a and 141b, and a group (141c and 141d). The light may be made to switch on by turns as the other lighting approaches in the group of 141a and 141c, and a group (141b and 141d). It is applicable to the example of the above matter (drawing 13 (drawing 12 (drawing 6 (drawing 1))) etc.

[0161] A configuration of being above (drawing 16) can also realize the lighting approach of (drawing 8). However, (drawing 16 (a)) is two division and (drawing 8 (b)) is quadrisection. By increasing the number of partitions, the lighting approach more near a scan condition is realizable. In addition, although the gobo 15 is arranged by (drawing 16), I hope that there is nothing. However, if the number of partitions increases, since the brightness of the display screen will fall relatively, the electric energy temporarily supplied to each light emitting device increases.

[0162] Moreover, what is necessary is just to constitute like (drawing 14), in order to realize the back light 16 of a scanning mode as shown in (drawing 13) using the fluorescence tubing 141.

[0163] In addition, as for the fluorescence tubing 141, it is more desirable than a cold cathode method to use a hot cathode method. This is because it is easy to adjust the brightness of fluorescence tubing. By adjusting the brightness of the fluorescence tubing 141, the brightness of a back light 16 can be freely controlled now. For example, the brightness of outdoor daylight is detected and the brightness of a back light 16 can be changed.

[0164] Moreover, some light guide plates can be set by the contents of an image of a display panel 21, and the strength of brightness can be attached. For example, in (drawing 1), when the image of the display panel 21 (not shown) applicable to a light guide plates [14c and 14d] location is bright, it is made brighter than a light guide plate besides light guide plates 14c and 14d. This is the same also in LED11.

[0165] The fluorescence tubing 141 is connected with the pulse motor or DC motor 143 in (drawing 14). The fluorescence tubing 141 is constituted so that it can rotate by the motor 143 by setting a shaft 143 as a core. Moreover, the fluorescence tubing 141 is arranged at the edge section of a light guide plate 14.

[0166] As the fluorescence tubing 14 is shown in (drawing 15), the light-shielding film 146 is formed in the front face. Moreover, the optical outgoing radiation section 145 is formed in the shape of a license. Moreover, the reflecting plate 144 with which the reflective film which consists of Ag or aluminum was formed in the side else [by which the light guide plate 14 has been arranged] is arranged, and it is constituted so that it may be efficient and the incidence of the light emitted from the optical outgoing radiation section 145 can be carried out to a light guide plate 14.

[0167] The fluorescence tubing 141 rotates by the motor 143. Rotation takes the rewriting timing of a display panel, and a synchronization. Whenever the fluorescence tubing 141 rotates one time, the optical outgoing radiation section 145 moves it to the right from Hidari of space. Therefore, as shown in (drawing 13), the lighting section 82 (A) can be moved in the vertical direction.

[0168] In addition, in (drawing 14), although the fluorescence tubing 141 is rotated, it does not limit to this, and fluorescence tubing 141 is made immobilization, may arrange the cylinder which has the optical outgoing radiation section 145 in that periphery section, and may rotate this tube by the motor 143. Moreover, color filters, such as red (R), green (G), and blue (B), are formed in the outgoing radiation section 145, and it can realize that it is the same with having scanned the luminescence location of R, G, and B as shown in the (drawing 118 (b)). Moreover, a scan time can be made quick by making rotational speed of the fluorescence tubing 146 high.

[0169] in addition -- etc. (drawing 16 (drawing 14)) etc. -- **** -- although [the fluorescence tubing 141] arranged in the edge section of a light guide plate 14 at a single tier, it may not limit to this, and as shown in (drawing 122), two or more fluorescence tubing 141 may be arranged. This is applicable also to LED11 grade.

[0170] In the (drawing 122 (a)), three fluorescence tubing 141 is arranged in the edge section of a light guide plate 14. Fluorescence tubing 141R is fluorescence tubing of red luminescence, and fluorescence tubing 141G are fluorescence tubing of green luminescence. Moreover, fluorescence tubing 141B is fluorescence tubing of blue luminescence. It is surrounded in the case 1221 of the fluorescence tubing 141.

[0171] The reflective film 51 which consists of aluminum or Ag is formed in the circular side of a case 1221. Moreover, as shown in the (drawing 122 (b)), light-scattering resin 171 may be formed between the reflective film 51 and the fluorescence tubing 141. Thus, by forming the reflective film 51 and light-scattering resin 171 in a case 1221, the light emitted from the fluorescence tubing 141 is mixed good, and is introduced into a light guide plate 14 (input).

[0172] (-- drawing 122 (a)) -- setting -- the fluorescence tubing 141R, 141G, and 141B -- the field -- it is one by one sequentially -- it is -- the light may be made to switch on by turns, and coincidence may be made to turn on 3 or 2 If 3 coincidence is switched on, the luminescent color of red, green, and blue will be mixed and it will become white. Moreover, if two are simultaneous, it will become the neutral colors of primary color. Moreover, if the strength of each fluorescence tubing 141 is changed, the color temperature of the light inputted into a light guide plate 14 is controllable (adjustment). The fluorescence tubing 141 may not be limited to three, and as shown in the (drawing 122 (b)), four or more are sufficient as it. Moreover, it cannot be overemphasized that two are sufficient.

[0173] The luminescent color may not be limited to R, G, and B, and other colors like cyanogen, yellow, and magenta are sufficient as it. Moreover, white is sufficient as the luminescent color of two or more fluorescence tubing 141. When two or more are white, the surface brightness of a light guide plate 14 can be changed by changing the lighting number of fluorescence tubing. Moreover, as shown in the (drawing 122 (b)), the fluorescence tubing 141 may be arranged to the both ends of a light guide plate 14.

[0174] In addition, in the (drawing 122 (b)), fluorescence tubing 141W carry out white (W) luminescence. Therefore, when a display panel possesses a color filter, fluorescence tubing 141W are made to turn on and off, when a display is constituted combining the lighting system and display panel of this invention. the case where a display panel is monochrome -- a gear tooth and the fluorescence tubing 141R, 141G, and 141B -- the field -- it can turn on and off sequentially and color display can be performed.

[0175] Although the above example has arranged the fluorescence tubing 141 to the end section or the both ends of a light guide plate, it may not limit to this, and as shown in (drawing 121), fluorescence tubing may be arranged at each edge. Moreover (drawing 121), although every one fluorescence tubing each which emits light in R, G, B, and W is used, it does not limit to this and all four are good also as W luminescence. Moreover, it is good also considering G luminescence, and R and B as every one in two.

[0176] Although the above example was an example using fluorescence tubing which performs R, G, B, and W luminescence, it may not limit to this, and as shown in (drawing 117), LED11 of R, G, and B luminescence may be arranged to each light guide plate 14. Moreover, as shown in the (drawing 118 (a)), LED11 of R, G, B, and W luminescence may be used. Moreover, to (drawing 13) and this appearance, as shown in (drawing 118), multicolor LED11, such as R, G, B, or R, G, B, W, may be formed or arranged in the shape of an array.

[0177] Moreover, it may be intermingled and other light emitting devices, such as LED components, such as R, G, B, and W, fluorescence tubing, or an EL element, may be used. For example, the configuration that perform local lighting with an LED component and fluorescence tubing performs whole lighting may be used. For example, the configuration which arranges EL back light (not shown) at the rear face of the configuration which arranges fluorescence tubing in the edge section of a light guide plate 14, and the 14th page of a light guide plate is distributed, and arranges an LED component, and a light guide plate 14, and arranges an LED component between organic or inorganic EL back light, and a light guide plate is illustrated.

[0178] In addition, the above was a configuration to which light emitting device 11,141 grade is used for light guide plate 14 grade, and incidence of the light is carried out. However, the configuration of turning on or switching off the part of a light guide plate 14 is realizable with other methods. For example, the method (EL back light) by EL (electroluminescence) is illustrated. It is the configuration which makes this a back light using two or more EL instead of the light guide plate 14 of (drawing 1). By carrying out sequential lighting of the EL (14a-14e being considered), the lighting condition of (drawing 8) is realizable. That is, a back light is a concept also including accident luminescence types, such as EL. In addition, a flat-surface fluorescent lamp etc. is illustrated as a thing of other self-luminescence molds. Moreover, the fluorescent indicator tube which Futaba Electron is manufacturing is

sufficient as FED etc. In addition, the back light of a light storage mold (for example, fluorescent paint) etc. may be used. This is also a self-luminescence mold.

[0179] In addition, it cannot be overemphasized that similar application also of the configuration [configuration / using the thing of a self-luminescence mold] (drawing 17) can be carried out.

[0180] The above example is the configuration which arranges or formed the light emitting device 11 in the edge of a light guide plate 14. The configuration of (drawing 17) is a configuration which has arranged the light emitting device 11 at the rear face of a light guide plate 14. In addition, (drawing 17 (b)) is a sectional view in aa' line of (drawing 17 (a)).

[0181] The hole which inserts LED11 is formed in the rear face of a light guide plate 14. LED11 is constituted so that it will not escape, once it is inserted by the projection 181 formed in a part of hole and is inserted, as shown in (drawing 18).

[0182] Moreover, the terminal electrode 173 of LED11 and the electrode pattern 172 formed in the rear face of a light guide plate 14 are connected by the Honda line 182. The electrode pattern 172 is formed by aluminum or Ag. Therefore, it functions also as reflective film arranged at the rear face of a light guide plate 14. therefore, the whole surface of the rear face of a light guide plate 14 -- and it is formed so that there may be no clearance as much as possible. A current is supplied to LED11 with these electrode patterns 172a (positive electrode) and 172b (negative electrode). Moreover, low resistance-ization can also be desired by enlarging the electrode pattern 172. As for the front face of the electrode pattern 172, it is desirable to form insulator layers (antioxidizing film), such as a front face SiO₂, in order to prevent oxidation.

[0183] In addition, the electrode pattern 172 may be formed by transparent materials (ITO etc.). In this case, (drawing 17 (b)) the reflective sheet 15 is arranged at the rear face of a light guide plate 14 so that it may be shown. Moreover, a direct LED chip may be formed or mounted on a light guide plate 14 (loading). Moreover, the antireflection film which consists of interference film (a monolayer, multilayer) may be formed in the rear face of ITO. Moreover, a lens may be formed in the optical outgoing radiation side of LED11, and a condensing function may be given.

[0184] A light emitting device 11 inputs light into a light guide plate 14 through the optical dispersing agent 171. The color nonuniformity of a light emitting device 11 is lost by this optical dispersing agent 171, and uniform lighting can be performed. In addition, it cannot be overemphasized that the configuration of (drawing 123) is applicable.

[0185] a light emitting device -- every Rhine -- or the light is made to switch on every two or more lines For example, lighting of light emitting device 11a of the range of A of (drawing 17) switches on light emitting device 11b of the range of B next. Henceforth, the light emitting device is made to turn on one by one. Thus, the method of presentation (the lighting approach) of driving (drawing 9 (drawing 8)) is realizable.

[0186] The diffusion sheet 22 (diffusion member) is formed or arranged in the optical outgoing radiation side of a light guide plate 14. Since brightness becomes high, as shown in (drawing 19), the optical diffusion section 31 is formed especially near the light emitting device 11. The optical diffusion section 31 is formed on direct or a sheet 22 on a light guide plate 14. Moreover, an optical diffusion may be given to sheet 22 self. Moreover, the optical diffusion section 31 for diffusing light further may be formed on the optical diffusion sheet 22.

[0187] What is necessary is just to arrange one sheet or two or more sheets for the prism sheet 23 or a prism plate in the optical outgoing radiation side of a sheet 22. In addition, direct prism may be formed in a light guide plate 14 like (drawing 2). By using the prism sheet 23, the directivity of the outgoing radiation light from a light guide plate 14 becomes narrow, and can form the display image of a display panel 21 into high brightness.

[0188] It considers as the approach of narrowing directivity of the light from a lighting system 16, and making the display of a display panel forming into high brightness, and as shown in (drawing 111), the approach using the micro-lens array (micro-lens sheet) 1112 is also illustrated.

[0189] Minute irregularity (micro lens 186) is formed so that the micro-lens array 1112 may have periodic refractive-index distribution. A micro lens 186 can be formed also by the ion exchange technique which Japanese Sheet glass is manufacturing.

[0190] In this case, the front face of the micro-lens array 1112 serves as a plane. Moreover, the thing using the La Stampa technique may be used like OMRON Corp. or Ricoh Co., Ltd. In addition, there is a diffraction grating etc. as a configuration which has periodic refractive-index distribution. Since these can also generate the strength of light spatially, this can also use them.

[0191] The micro-lens array 183 may be formed or produced rolling out a resin sheet or by carrying out press working of sheet metal. In addition, it is good for the front face of the micro-lens array 1112 to form an antireflection film.

[0192] Moreover, it is desirable by arranging a micro-lens array (micro-lens sheet) to the optical outgoing radiation side of a light guide plate 14, and carrying out eccentricity of the focus of a micro lens to give directivity. In this case, a hole is formed near the focus of a micro lens and the outgoing radiation of the light from light emitting device 11 grade is made to be carried out from this hole.

[0193] Although (drawing 19) is an example which has arranged the LED11 grade of one color in the shape of a matrix, it may arrange or form the multicolor light emitting device 11 in the one matrix section like (drawing 20).

[0194] In (drawing 20), LED11 of red (11G), green (11G), blue (11B), and two whites (11W) is arranged. (Drawing 122) etc. -- the case where the display panel 21 of monochrome is used as explained -- the field, by driving sequentially, when using the display panel 21 which can realize color display and possesses a color filter, color display can be realized by making white LED11 turn on. Moreover, the color temperature of the luminescent color of

a light guide plate 14 can be adjusted freely.

[0195] Moreover, the white light on appearance may be generated not the thing to limit to a field sequential method but by making sequential lighting of the LED of R, G, and B carry out for a short time very much. Of course, lighting is always sufficient.

[0196] Although divided in the shape of [square] a matrix with the gobo (reflecting plate) 15 in (drawing 20), it may not limit to this, and as shown in (drawing 21), you may divide into other configurations, such as a hexagon. The distance from the core of each matrix to a periphery becomes uniform, and it is hard to generate brightness nonuniformity by making it the shape of a hexagon etc. In addition, a gobo is not formed or arranged and it cannot be overemphasized that ** is also good.

[0197] The above example was a configuration which has arranged the LED11 grade at the rear face of a light guide plate 14. As shown in (drawing 112), you may also embed the fluorescence tubing 141 at a light guide plate 14. As shown in the (drawing 113 (a)) as a configuration embedded at a light guide plate 14, a hole 1131 is formed in a light guide plate 14, and the configuration which inserts the fluorescence tubing 141 in this hole 1131 is illustrated.

[0198] It is desirable that the fluorescence tubing 141 is filled up with the optical dispersing agent 171, adhesives, or the optical coupling material 126 for the purpose of improvement in efficiency for light utilization for the purpose of color nonuniformity amendment for the purpose of immobilization in a hole 1131 or it is the brightness nonuniformity of the fluorescence tubing 141. This is the same also about the (drawing 113 (b) and (c)).

[0199] Moreover, the (drawing 113 (b)) is the configuration of having used two or more light guide plates (14a, 14b, 14c). The impression (1131) is formed in the edge of a light guide plate 14. Moreover, the reflecting plate 15 is arranged in the rear face of a light guide plate 14. Thus, by constituting, a large-sized back light can be manufactured easily. In addition, a gobo 15 may be formed or arranged between each light guide plate 14.

[0200] The (drawing 113 (c)) is the configuration which formed the reflecting plate 51 in the end of each light guide plate 14. According to this configuration, the light which fluorescence tubing 141b emitted illuminates only light guide plate 14b, for example. Therefore, it can make it possible to perform brightness adjustment according to an individual for each light guide plate 14.

[0201] In addition (drawing 112 drawing 113), although it illustrated as if it set, it formed the hole 1131 in the light guide plate 14 and it had arranged one fluorescence tubing in this hole 1131 Fluorescence tubing of the luminescent color, such as R, G, B, and W, may be arranged not in the thing to limit to this but in one hole 1131, and fluorescence tubing of two or more same colors may be arranged in one hole 1131. Moreover, in (drawing 112), it cannot be overemphasized that it is [a / fluorescence tubing 141] good also considering G luminescence and 141c as B luminescence in R luminescence and 141b. In addition, as for the arrangement problem of the fluorescence tubing 141, similar application of the relation of - (formula 1) (formula 4) is carried out. Moreover, LED, fluorescence tubing, etc. may intermingle for them and use two or more light emitting devices.

[0202] In addition, a light guide plate 14 may use what is not limited to a transparent plane color, and could use what was colored R color and B color, and added the dispersing agent in the light guide plate 14. As for the period (the formation pitch Pr of Yamagata) of the irregularity of the prism sheet 22, it is desirable to satisfy the following conditions from the relation of moire.

[0203] Generating will become [moire] intense if the formation pitch Pr of Yamagata and the formation pitch Pd of the pixel of a display panel 21 serve as specific relation.

[0204] When the pixel pitch of a display panel is set to Pd about moire, the pitch P of the moire to generate is $1 - P/Pd - 1/Pr$. (formula 7)

It can express. It is $Pr/Pd = 2/(2n+1)$ that the maximum moire pitch serves as min. (formula 8)

It is at the ** time, and the modulation factor of moire becomes small, so that n is large. Therefore, it is good to decide Pr/Pd to fill (a formula 8). If it is 80% or more 120% or less of range of the value (it determined) calculated with (the formula 8), it is enough practically. First, what is necessary is just to determine n.

[0205] A display panel 21 can use various things. As (drawing 9) explained, when making animation display good, it is good for OCB mode or deltan to use ultra high-speed large TN mode, antiferroelectric liquid crystal mode, and strong dielectric liquid crystal mode. Moreover, when using a display panel also as a reflective mold, it is good to use macromolecule distribution liquid crystal mode, ECB mode, TN liquid crystal mode, and the STN LCD mode.

[0206] Hereafter, the display combined with the display panel of this invention and the lighting system of this invention is explained. (Drawing 22) is the explanatory view of the display panel of this invention.

[0207] The counterelectrode 225 is formed in the opposite substrate 222. In addition, since there is no need when it is in IPS (In Plane Switching) mode which Hitachi etc. developed, it is not necessary to form a counterelectrode 225.

[0208] On the other hand, the thin film transistor as a switching element (not shown), the pixel electrode 230 as a pixel, and the signal-line 228 grade are formed in the array substrate 221.

[0209] A liquid crystal layer is made to pinch between the opposite substrate 222 and the array substrate 221. As a liquid crystal layer 226, TN liquid crystal, STN LCD, strong dielectric liquid crystal, antiferroelectric liquid crystal, guest host liquid crystal, OCB liquid crystal, a smectic liquid crystal, cholesteric liquid crystal, and macromolecule distribution liquid crystal (it is henceforth called PD liquid crystal) are used. When not making especially a movie display important, it is desirable to use PD liquid crystal from a viewpoint of efficiency for light utilization.

[0210] As a PD liquid crystal ingredient, a pneumatic liquid crystal, a smectic liquid crystal, and cholesteric liquid crystal may be desirable, and you may be the mixture also containing matter other than a single, or two or more kinds of liquid crystallinity compounds and liquid crystallinity compounds.

[0211] In addition, it is [that the pneumatic liquid crystal of the pneumatic liquid crystal of the comparatively large cyano biphenyl system of the difference of an extraordinary index n_e and the Tsunemitsu refractive index n_0 or a tolan system stable to aging, and the Krol system is desirable among the liquid crystal ingredients described previously, and a dispersion property also has the good pneumatic liquid crystal of a tolan system, and it is hard to produce aging especially] the most desirable.

[0212] A polymer transparent as a resin ingredient is desirable, and uses photo-curing type resin from points, such as an ease of a production process, and separation with a liquid crystal phase, as a polymer. The acrylic monomer which ultraviolet-rays hardenability acrylic resin is illustrated as a concrete example, and carries out polymerization hardening especially by UV irradiation, and the thing containing acrylic oligomer are desirable. A dispersion property can produce good PD liquid crystal layer 226, and the photoresist acrylic resin which has a fluorine radical especially is hard to produce aging and has it. [desirable]

[0213] Moreover, for said liquid crystal ingredient, it is this better ** that the Tsunemitsu refractive index n_0 uses [that the Tsunemitsu refractive index n_0 uses the thing of 1.49 to 1.54] the thing of 1.50 to 1.53 also in this better **. Moreover, it is desirable that refractive-index difference ** n uses or more 0.20 0.30 or less thing. If n_0 and ** n become large, a heatproof and lightfastness will worsen. Although a heatproof and lightfastness will become good if n_0 and ** n are small, a dispersion property becomes low and display contrast becomes less enough.

[0214] It is desirable that the Tsunemitsu refractive index n_0 adopts the photoresist acrylic resin with which 1.50 to 1.53 and ** n have a fluorine radical as a resin ingredient, using the pneumatic liquid crystal of 0.30 or less or more 0.20 tolan system as a component of the liquid crystal ingredient of PD liquid crystal from the above thing and the result of examination.

[0215] In addition, the refractive index n_p when a resin ingredient hardens, and the Tsunemitsu refractive index n_0 of a liquid crystal ingredient are made to carry out abbreviation coincidence. When electric field are impressed to the liquid crystal layer 226, a liquid crystal molecule (not shown) carries out orientation to an one direction, and the refractive index of the liquid crystal layer 226 serves as n_0 . Therefore, in accordance with the refractive index n_p of resin, the liquid crystal layer 226 will be in a light transmission condition. If a difference with refractive indexes n_p and n_0 is large, even if it will impress an electrical potential difference to the liquid crystal layer 226, the liquid crystal layer 226 will not be in a transparency condition completely, but display brightness falls. As for the refractive-index difference with refractive indexes n_p and n_0 , less than 0.1 are desirable, and less than further 0.05 are desirable.

[0216] The rate of the liquid crystal ingredient in PD liquid crystal layer 226 has 40 % of the weight – about 95 good % of the weight, and 60 % of the weight – its about 90 % of the weight is preferably good. There are few amounts of a liquid crystal drop that it is 40 or less % of the weight, and the effectiveness of dispersion is scarce. Moreover, the inclination a macromolecule and liquid crystal carry out [an inclination] phase separation to vertical two-layer one when it comes to 95 % of the weight or more becomes strong, the rate of an interface becomes small, and a dispersion property falls.

[0217] As for the mean particle diameter of the water drop-like liquid crystal (not shown) of PD liquid crystal, or the average aperture of a polymer network (not shown), it is desirable to make it 0.5 micrometers or more 3.0 micrometers or less. Especially, 0.8 micrometers or more 1.6 micrometers or less are desirable. When the light which PD liquid crystal display panel 21 modulates is short wavelength (for example, B light), it is small, and in the case of long wavelength (for example, R light), it enlarges. If the mean particle diameter of water drop-like liquid crystal or the average aperture of a polymer network is large, although the electrical potential difference changed into a transparency condition becomes low, a dispersion property will fall. Although a dispersion property will improve if small, the electrical potential difference changed into a transparency condition becomes high.

[0218] A thing, resin, etc. with which liquid crystal was distributed in resin, rubber, metal particles, or ceramics (barium titanate etc.) water drop-like serve as macromolecule distribution liquid crystal (PD liquid crystal) said to this invention with the shape of sponge (polymer network), and that with which liquid crystal was filled up between the shape of the sponge corresponds. It also includes that resin otherwise serves as stratified **. Moreover, the liquid crystal section and the polymer section are periodically formed like a Japanese-Patent-Application-No. No. 54390 [four to] official report. And that (NCAP) by which the liquid crystal component is enclosed with the capsule-like hold medium is also included like what has the light modulation layer made to separate completely, and JP,3-52843,B. Furthermore, the thing containing dichroism and polychroism coloring matter is also included in liquid crystal or resin. Moreover, there are also structure in which a liquid crystal molecule carries out orientation in accordance with a resin wall as a similar configuration, JP,11-249175,A, and JP,6-347765,A. These also call PD liquid crystal. Moreover, the thing which carried out orientation of the liquid crystal molecule, and made 353 in liquid crystal contain a resin particle etc. is also PD liquid crystal. Moreover, it is PD liquid crystal which forms a resin layer and a liquid crystal layer by turns, and has the dielectric Miller effect. Furthermore, a liquid crystal layer contains what was constituted by the multilayer more than two-layer that there is nothing much more then.

[0219] That is, PD liquid crystal means the thing at large by which the light modulation layer was constituted from a liquid crystal component and other ingredient components. Although a light modulation method forms an optical image mainly by dispersion-transparency, a polarization condition, a rotatory-polarization condition, or a birefringence condition may be changed to others.

[0220] In PD liquid crystal, it is desirable to form in each pixel the part (field) from which the mean particle diameter of a liquid crystal drop or the average aperture of a polymer network differs. A different field is made into two or more kinds. T-V (dispersion condition-applied voltage) properties differ by changing mean particle diameter etc.

That is, if an electrical potential difference is impressed to a pixel electrode, the field of the 1st mean particle diameter will be in a transparency condition first, and then the field of the 2nd mean particle diameter will be in a transparency condition. Therefore, an angle of visibility spreads.

[0221] It carries out to changing the mean particle diameter on a pixel electrode etc. by irradiating ultraviolet rays at a mixed solution through the mask with which the pattern with which the permeability of ultraviolet rays differs periodically was formed.

[0222] irradiating ultraviolet rays at a panel using a mask -- every part of a pixel -- or the exposure reinforcement of ultraviolet rays can be changed for every part of a panel. If there are few amounts of UV irradiation per time amount, the mean particle diameter of water drop-like liquid crystal will become large, and it will become small if many. The path of water drop-like liquid crystal and the wavelength of light have correlation, and even if a path is too small and it is too large, a dispersion property falls. In the light, the range of 0.5-micrometer or more 2.0-micrometer or less mean particle diameter is good. The 0.7-micrometer or more range of 1.5 micrometers or less is still more preferably suitable.

[0223] The mean particle diameter for every parts of every part of a pixel and a panel is formed, respectively so that 0.1-0.3 micrometers may differ. In addition, since the ultraviolet-rays reinforcement to irradiate changes greatly with the wavelength of ultraviolet rays, the quality of the material of a liquid crystal solution, a presentation, or panel structures, it asks experimentally.

[0224] As the formation approach of PD liquid crystal layer, after closing the perimeter of two substrates by closure resin, a mixed solution is pressurization-poured in or vacuum poured in from an impregnation hole, resin is stiffened with an exposure or heating of ultraviolet rays, and there is the approach of carrying out phase separation of a liquid crystal component and the resinous principle. In addition, after a mixed solution is dropped on a substrate and making it pinch with one of other substrates, it rolls out, and after homogeneity makes said mixed solution thickness, resin is stiffened with an exposure or heating of ultraviolet rays, and there is the approach of carrying out phase separation of a liquid crystal component and the resinous principle.

[0225] Moreover, after applying a mixed solution with a roll quota or a spinner on a substrate, it is made to pinch with one of other substrates, resin is stiffened with an exposure or heating of ultraviolet rays, and there is the approach of carrying out phase separation of a liquid crystal component and the resinous principle. Moreover, after applying a mixed solution with a roll quota or a spinner on a substrate, once, a liquid crystal component is washed and there is also a method of pouring a new liquid crystal component into a polymer network. Moreover, after applying a mixed solution to a substrate and carrying out phase separation by ultraviolet rays etc., there is also a method of sticking other substrates and liquid crystal layers with adhesives.

[0226] In addition, the light modulation layer of the liquid crystal display panel of this invention is not limited to one kind of light modulation layer, and a light modulation layer may consist of two or more layers, such as PD liquid crystal layer, TN liquid crystal layer, or a strong dielectric liquid crystal layer. Moreover, the glass substrate or the film may be arranged between the 1st liquid crystal layer and the 2nd liquid crystal layer. A light modulation layer may consist of three or more layers.

[0227] In addition, although the liquid crystal layer 226 was used as PD liquid crystal on these specifications, depending on the configuration, the function, and the purpose of using a display panel, it may not necessarily limit to this, and you may be other liquid crystal, such as TN liquid crystal layer or a guest host liquid crystal layer, a HOMEOTORO pick liquid crystal layer, a strong dielectric liquid crystal layer, an antiferroelectric liquid crystal layer, and a cholesteric-liquid-crystal layer.

[0228] The thickness of the liquid crystal layer 226 has the desirable 3-micrometer or more range of 12 micrometers or less, and its the 5 more micrometer or more range of 10 micrometers or less is desirable. If thickness is thin, a dispersion property is bad, contrast cannot be taken, but if conversely thick, the design of X driver circuit (not shown) which generates the signal which must stop having to perform a high-voltage drive and is made to turn TFT on and off, and Y driver circuit (not shown) which impresses a video signal to a source signal line etc. will become difficult.

[0229] As thickness control of the liquid crystal layer 226, a black glass bead, black glass fiber, a black resin bead, or a black resin fiber is used. Since especially a black glass bead or black glass fiber has high light absorption nature, and there is little number sprinkled in the liquid crystal layer 226 since it is hard and it ends very much, it is desirable.

[0230] Between the pixel electrode 230 and the liquid crystal layer 226 and between the liquid crystal layer 226 and a counterelectrode 225, it is effective to form an insulator layer 271 (refer to drawing 27). The inorganic substance of organic substance [, such as orientation film, such as polyimide used for TN liquid crystal display panel etc. as an insulator layer (orientation film) 271, and poly vinyl alcohol (PVA)], SiO₂, SiN_x, and Ta₂O₃ grade is illustrated. Preferably, the organic substance, such as viewpoints, such as adhesion, to polyimide, is good. The retention of a charge can be improved by forming an insulator layer on an electrode. Therefore, a daylight display and a high contrast display are realizable.

[0231] An insulator layer 271 is effective in preventing that the liquid crystal layer 226 and an electrode 230 exfoliate. Said insulator layer 271 plays a role of a glue line and a buffer coat.

[0232] Moreover, if an insulator layer is formed, it is effective in the aperture (bore diameter) of the polymer network of the liquid crystal layer 226 or the particle diameter of water drop-like liquid crystal becoming homogeneity mostly. This is considered for covering with an insulator layer 271 even if the organic residue remains on the counterelectrode 225 and the pixel electrode 230. The PVA of the effectiveness of covering is better than

polyimide. Moreover, also in the case of random domain orientation, in order that an insulator layer 271 may give extensive viewing-angle nature for TN liquid crystal, when orientation is needed, it is useful. It is because it controls that the impurity from glass substrate 222 grade is eluted in the liquid crystal layer 226.

[0233] In addition, in case an insulator layer is formed with the organic substance, the thickness has the desirable range 0.02 micrometers or more of 0.1 micrometers, and 0.03 more micrometers or more its 0.08 micrometers or less are desirable.

[0234] Soda glass and a quartz-glass substrate are used as a substrate 222,221. A metal substrate, a ceramic substrate, a silicon single crystal, and a silicon polycrystal substrate can also be used for others. Moreover, resin films, such as polyester film and a PVA film, can also be used. That is, the thing of the shape of a film, such as not only a tabular thing but a sheet, is sufficient as a substrate at this invention. For example, plastic plates, such as a polycarbonate, are illustrated.

[0235] What the color filter 223 dyed resin, such as gelatin and an acrylic, (resin color filter) is illustrated. In addition, you may form with the dielectric color filter which carried out the laminating of the dielectric thin film of a low refractive index, and the dielectric thin film of a high refractive index by turns, and gave optical effectiveness (it is called a dielectric color filter). Moreover, the hologram color filter which separates light according to the hologram effectiveness is sufficient. Since the red purity of especially a current resin color filter is bad, it is desirable to form a red color filter by the dielectric mirror. That is, what is necessary is to form 1 or 2 colors with the color filter which consists of dielectric multilayers, and just to form other colors with a resin color filter.

[0236] An antireflection film 229 (AIR coat) is given to the field where a display panel 21 touches air. An AIR coat has the configuration of three layers, or a two-layer configuration. In addition, in the case of three layers, it is used in order to prevent reflection in the wavelength band of the large light, and it calls this a multi-coat. In a two-layer case, it is used in order to prevent reflection in the wavelength band of the specific light, and it calls this V quart. A multi-coat and V quart are properly used according to the application of a liquid crystal display panel.

[0237] In the case of a multi-coat, optical thickness carries out $nd_1 = \lambda / 4$ laminatings of $nd_1 = \lambda / 2$ and the magnesium fluoride (MgF₂) for $nd = \lambda / 4$, and a zirconium (ZrO₂), and an aluminum oxide (aluminum 2O₃) is formed. Usually, a thin film is formed as a value of 520nm or near of those as λ . optical in silicon monoxide (SiO) in the case of V quart — $nd_1 = \lambda / 4$ laminatings of $nd_1 = \lambda / 4$ or yttrium oxide (Y₂O₃), and the magnesium fluoride (MgF₂) are carried out, and thickness $nd_1 = \lambda / 4$, and magnesium fluoride (MgF₂) are formed. It is better to use Y₂O₃, when modulating blue glow, since SiO has an absorption band region in a blue side. Moreover, since the direction of Y₂O₃ is stable also from the stability of the matter, it is desirable.

[0238] In addition, the antireflection film 229 may be formed in the polarizing plate arranged to the optical plane of incidence or the optical outgoing radiation side of a display panel, and optical coupling of this antireflection film and display panel may be carried out by optical coupling material. Which thing which a refractive index becomes from 1.4 or less or more 1.3 the resin of a low refractive index also in what is depended on the optical interference film is sufficient as the reflective film 229 on a polarizing plate.

[0239] The pixel electrode 230 is formed with transparent electrodes, such as ITO. In addition, in order to use the pixel electrode 230 as a reflective mold, it is aluminum (aluminum) about a front face in the reflector which consists of a metal thin film, or forms with silver (Ag). Moreover, Ti etc. is made to mediate from the technical problem on a process, and reflective film, such as Ag, is formed. In addition, in the case of a reflective mold, the pixel electrode 230 is good also as reflective film which consists of dielectric multilayers. In this case, since it is not an electrode, in order to consider as an electrode, the electrode which becomes ITO, or the electrode which becomes the lower layer of dielectric multilayers from a metal or ITO is formed in the front face of dielectric multilayers.

[0240] Minute irregularity may be formed in the pixel electrode 230 of the display panel of this invention. An angle of visibility becomes large by forming irregularity. In the case of a reflective mold, there is effectiveness especially. In the case of TN liquid crystal display panel, the height of minute irregularity makes it 0.3 micrometers or more 1.5 micrometers or less. this — if out of range, a polarization property will worsen. Moreover, minute irregularity forms a configuration smoothly. For example, it has the shape of circular or sign KAPU. Moreover, irregularity may be formed with a metal etc.

[0241] As the approach of formation, minute heights are formed in the field used as a pixel by the metal thin film or the insulator layer. Or a minute crevice is formed by etching said film. ITO or the metal thin film used as the pixel electrode 230 is formed in these concave or heights by vacuum evaporation. or said concave heights top — an insulator layer etc. — one layer — or two or more layers are formed and the pixel electrode 230 etc. is formed on it. By forming a metal thin film in concave or heights as mentioned above, inclination sticks moderately and the level difference of concave or heights can form the concave heights which change smoothly.

[0242] Moreover, even if it is the case where the pixel electrode 230 is a transparency mold, it is effective to form the ITO film in piles and to form a level difference. It is because incident light diffracts with this level difference and display contrast or an angle of visibility improves.

[0243] Switching elements may be 2 terminal components, such as a thin-film diode (TFD) besides a thin film transistor (TFT), ring diode, and MIM, or varicap, a thyristor, an MOS transistor, FET, etc. In addition, these all call it a switching element or a thin film transistor. Furthermore, a thing and a method write-in [optical] whose switching element is, and a heat write-in method are also contained. [like the plasma addressing liquid crystal (PALC) which controls the electrical potential difference impressed to a liquid crystal layer by the plasma which Sony, Sharp, etc. made as an experiment] That is, structure switchable [to provide a switching element] is shown. PALC also calls this a counterelectrode, although a counterelectrode is a stripe-like.

[0244] Moreover, the display panel 21 of this invention mainly forms the switching element of a driver circuit and a pixel in coincidence. In addition, what was formed using single crystals, such as an elevated-temperature polish recon technique besides what was formed with the low-temperature polish recon technique, or a silicon wafer substrate, is in the technical range. Of course, amorphous silicon display panels are also technical criteria.

[0245] The source signal line 233 and the gate signal line (not shown) are covered with the dielectric film 227 (it is henceforth called a low dielectric film) lower than the specific inductive capacity of the liquid crystal layer 226. It is preventing or controlling that the pixel electrode 230 and source signal-line 228 grade cause electromagnetic association with this low dielectric film 227. As a low dielectric film 227, silicon nitride (SiNX), silicon oxide (SiO₂), polyimide, poly VINYL alcohol (PVA), gelatin, and an acrylic are illustrated. This low dielectric film 227 functions also as smoothing film (leveling film / flattening film) which carries out smooth [of the irregularity by TFT, a source signal line, etc.].

[0246] Light absorption material, such as carbon, adds and some low dielectric films 227 are good also as a resin black matrix.

[0247] The pixel electrode 230 forms an edge so that it may lap in the upper part of the source signal line 228. Thus, by constituting, the source signal line 228 serves as a light-shielding film, and the optical leakage from between the pixels which adjoined is lost.

[0248] However, this is an ideal case and is not implementation-like. In practice, optical leakage can be observed when a display panel is seen from across. Moreover, orientation ***** of TN liquid crystal molecule occurs with the irregularity of the pixel electrode 230, and optical leakage occurs.

[0249] In order to prevent this optical leakage, as shown in (drawing 22), black (matrix BM) 224b is formed. What added carbon, such as acrylic resin, etc. may be used as a formation ingredient of BM224, or what distributed black coloring matter or a black pigment in resin may be used, and gelatin and casein may be dyed by black acid dye like a color filter 223. It can also carry out making the fluoran system coloring matter which becomes single and black as an example of the pigmentum nigrum color, and using it, and the color scheme black which mixed green system coloring matter and red system coloring matter can also be used.

[0250] What is necessary is not to be limited to this, when using the liquid crystal display panel of this invention as a light valve of a projection mold indicating equipment, and just to make R light absorb as BM224 of the liquid crystal display panel which modulates R light, although all the above ingredients are black ingredients.

[0251] Therefore, using coloring matter, natural resin can be dyed or the ingredient which distributed coloring matter in synthetic resin can be used. For example, what is necessary is just to combine two or more kinds in [those] one suitable sort from azo dye, anthraquinone dye, phthalocyanine dye, triphenylmethane dye, etc. It is desirable to use what has especially the relation of the complementary color. For example, when incident light is blue, BM224 is made to color it yellow. It cannot be overemphasized that it is desirable that it is close to 100% as for the rate of light absorption of BM224. The effectiveness that an absorption coefficient is desirable at 50% or more is demonstrated greatly.

[0252] Since between color filters 223 becomes indistinct [the boundary section], BM224a may be formed in the boundary section.

[0253] In addition, BM224a may consist of metal thin films, such as chromium (Cr). However, since the rate of a light reflex of Cr is as low as 60%, when using the liquid crystal display panel 21 as a light valve of a projection mold indicating equipment, a problem generates it.

[0254] Hereafter, especially the display panel of this invention used as a light valve of a projection mold indicating equipment is explained, referring to - (drawing 23 (a)) (drawing 24 (c)).

[0255] BM224 is formed in the opposite substrate 222 in order to make it optical leakage not occur from between pixels in a display panel 21. As a formation ingredient of BM224, chromium (Cr) is used from a viewpoint of a protection-from-light property. An intense light carries out incidence to the display panel 21 as a light valve used for drawing 114 Projection mold indicating equipments, such as (drawing 124) and (drawing 79). Since 40% of the incident light which carried out incidence to BM224 is absorbed by BM224, a display panel 21 is heated and deteriorates.

[0256] The display panel of this invention is using aluminum (aluminum) as a component of BM224a. Since aluminum reflects 90% of light, the problem of a display panel 21 being heated and deteriorating is lost. However, since it is bad as compared with Cr, as for aluminum, a protection-from-light property needs to form thickness thickly. As an example, the thickness of aluminum which acquires the protection-from-light property of 0.1 micrometers of thickness of Cr is 1 micrometer. That is, it is necessary to form in 10 times as many thickness as this.

[0257] On the other hand, since TN liquid crystal display panel 21 etc. needs to carry out orientation of the liquid crystal molecule, it needs to perform rubbing processing. In case rubbing processing is performed, if irregular, poor rubbing will occur. Therefore, if aluminum is used for the opposite substrate 222 and BM224 is formed, irregularity occurs in a substrate 222 and good rubbing cannot be performed.

[0258] In order to cope with this technical problem, in the opposite substrate 222, the display panel 21 of this invention forms a crevice 233 in the location which forms BM224 first, and it forms BM so that this crevice 683 may be filled. After a crevice's 233 applying a resist 1151 to a substrate 222 as shown in (drawing 115) (drawing 115 (a)), and performing patterning, it can form easily by etching with a fluoric acid solution (drawing 115 (b)). The depth of a crevice is set to 0.6 micrometers or more 1.6 micrometers or less, and is set to 0.8 micrometers or more 1.2 micrometers or less still more preferably. The depth of this crevice 233 can be easily adjusted by adjusting etching time.

[0259] in addition, the formed crevice 233 -- a front face -- that -- for the ***** reason, to the substrate 222, inorganic materials, such as SiO₂ and SiN_x, are vapor-deposited after forming a crevice 233 by 0.05-micrometer or more thickness 0.2 micrometers or less.

[0260] Thus, aluminum thin film is vapor-deposited to the constituted crevice 233, and BM224 is formed in it (drawing 115 (c)). Therefore, the heights by BM224 formation are not generated in the front face of the opposite substrate 222. Therefore, good rubbing can be performed.

[0261] In order to raise protection-from-light nature if needed, the laminating of the metal thin film 224b set to BM from Cr or titanium (Ti) is carried out to aluminum thin film 224a in piles (drawing 23 (a), (b)). This metal thin film 224b is effective in making it aluminum thin film 224a not contact ITO of a counterelectrode 225 directly. It is because a galvanic action will corrode if the ITO thin film 225 contacts aluminum thin film 224a.

[0262] In addition, the thin film which carries out a laminating may not be limited to two-layer, and three or more layers are sufficient as it. Moreover, the thin film which consists of organic materials, such as acrylic resin which it does not limit [acrylic resin] to a metal thin film and had carbon added, or a carbon simple substance, is sufficient as thin film 224b which carries out a laminating. For example, light absorption film 224b like (drawing 22) is illustrated. The thickness of BM which carried out the laminating of the thickness of BM of the monolayer of such aluminum film 224a or aluminum film 224a, the metal membrane 224b, etc. sets to 0.4 micrometers or more 1.4 micrometers or less, and is set to 0.6 micrometers or more 1.0 micrometers or less still more preferably. In addition, BM224 may be constituted from a monolayer of for example, not only this but aluminum film, and although it showed the case where it consisted of BM 224a and 224b, may carry out the laminating of the ingredient of a different kind to a multilayer, and may constitute it from (drawing 23 (a)) and (drawing 23 (b)). Henceforth, when not asking a monolayer and a laminating, generally it is referred to as BM224.

[0263] Smoothing film 227a is formed on BM224 with which the crevice 233 was filled up (drawing 115 (d)). As a formation ingredient of the smoothing film 227, inorganic materials, such as organic materials, such as acrylic resin, gelatin resin, polyimide resin, an epoxy resin, and poly BINIIRU alcoholic resin (PVA), or silicon oxide (SiO₂), and silicon nitride (SiN_x), etc. are illustrated. In addition, it is desirable to adopt ultraviolet curing type resin especially. However, since transmission is good, when inorganic materials, such as SiO₂, have thermal resistance, and adopting as a light valve of a projection mold indicating equipment in a large wavelength band, they are desirable.

[0264] As thickness of smoothing film 227a (drawing 23 (a)), 0.2 micrometers or more 1.4 micrometers or less are desirable, and it is desirable to constitute in 0.5 micrometers or more 1.0 micrometers or less especially. ITO as a counterelectrode 225 is formed on this smoothing film 227a. (Drawing 23 (b)) is the configuration using the color filter 223 as smoothing film not using smoothing film 227a.

[0265] When the smoothing film 227a and 227b is formed with inorganic materials, such as SiO₂, a front face is ground and graduated after forming the smoothing film 227. Polish processing is performed mechanically or chemically. Since SiO₂ is comparatively soft, it is easy to grind. A counterelectrode 225 is formed after performing polish processing (drawing 115 (e)). In addition, also when the smoothing film 227a and 227b is organic materials, it cannot be overemphasized by performing polish processing that the good smoothing film 227a and 227b can be formed.

[0266] Moreover, after forming BM224 in a crevice 233 as other examples more thickly than the depth of a crevice 233, polish processing may be carried out and a front face may be graduated. It can consider as a configuration with which BM224 was exactly filled up into the crevice 233 by doing in this way. Since the metal of BM is soft as compared with the glass of the opposite substrate 222, it is easy to be ground. ITO as a counterelectrode 225 is formed in a front face after smoothing. Therefore, it is not necessary to form smoothing film 227a. Of course, smoothing film (insulator layer) 227a is thinly formed after grinding BM224 from a viewpoint of preventing an impurity being eluted from a substrate 222 rather than a smoothing function, and it is after that, A counterelectrode 225 may be formed. In this configuration, it functions as an insulator layer and a protective coat rather than it calls it the smoothing film. Therefore, the very thin film is sufficient like the orientation film. In addition, the counterelectrode 225 is unnecessary when a liquid crystal display panel is IPS structure. Therefore, what is necessary is not to form a counterelectrode 225 in this case, but just to form the orientation film on smoothing film 227a. Moreover, in the case of MVA mode, the concave heights by BM may be used for orientation control.

[0267] in addition -- (drawing 23 (a)) -- (although BM224 considered as the metal multilayers containing aluminum or aluminum in drawing 23 (b)), it may not limit to this and you may form by the dielectric multilayers (interference film) which formed the dielectric film of a low refractive index, and the dielectric film of a high refractive index in the multilayer.

[0268] Dielectric multilayers reflect the light of specific wavelength by optical interferential action, and there is no absorption of light on the occasion of reflection. Therefore, BM224 without absorption of incident light can be constituted.

[0269] Moreover, silver (Ag) may be used instead of aluminum. It is set to BM224 with high Ag and a reflection factor good [Ag]. In addition, Au etc. can be used.

[0270] In addition, when adopting the interference film as BM224, the thickness of the thin film which constitutes BM224 sets to 1.0 micrometers or more 1.8 micrometers or less, and is set to 1.2 micrometers or more 1.6 micrometers or less still more preferably.

[0271] Moreover, the depth of a crevice 233 is set to 1.2 micrometers or more 2.2 micrometers or less, and is set to 1.4 micrometers or more 1.8 micrometers or less still more preferably.

[0272] in addition, with the configuration of (drawing 23 (a)) and (drawing 23 (b)) It is not what is limited to this

although a crevice 683 is formed in the opposite substrate 235 and BM224 is produced to this crevice 233. Without forming a crevice 233 in the opposite substrate 222, BM 224a and 224b which consists of aluminum, Ag, a multilayer metal thin film, or interference film may be formed (drawing 116 (a)), and smoothing film 227a may be formed on this BM224 (drawing 116 (b)). At this time, the thickness of smoothing film 227a sets to 1.0 micrometers or more 3.0 micrometers or less, and is set to 1.4 micrometers or more 2.4 micrometers or less still more preferably. Moreover, a front face may be ground for smoothing film 227a after formation (drawing 116 (c)). By grinding, the irregularity of BM224 is lost and the front face of the opposite substrate 222 is graduated. In addition, the electromechanical polish by chemical or electric polish and arc discharge by the mechanical polish deleted mechanically, etching, and electric corrosion is illustrated as polish. In addition, with [irregularity] an allowed value [less than], it cannot be overemphasized that it is not necessary to grind. Then, a counterelectrode 225 is formed (drawing 116 (d)).

[0273] moreover -- (-- drawing 23 (a)) -- (-- although [drawing 23 (b))] a crevice 224 is formed in the opposite substrate 222 and BM224 is produced to a crevice 233, it may not limit to this, and a crevice 233 may be formed in the array substrate 221, and BM224 may be formed. In this case, the source signal line 228 or TFT242 grade is formed on BM224. Thus, by forming the crevice 233 of the array substrate 221 and forming TFT241 grade in this crevice 233, the front face of the array substrate 221 is also graduated and good rubbing can be carried out. In this case, as shown in (drawing 23), it is not necessary to form BM224 in the opposite substrate 222. The crevice 233 of a pan or the array substrate 221 may be formed, and the signal line of source signal-line 228 grade, TFT, etc. may be formed in this crevice. Moreover, in addition, the smoothing film is formed after formation and the pixel electrode 230 is formed on this smoothing film.

[0274] BM224 and a counterelectrode 225 are the circumferences of a viewing area, or the thing without a viewing area which it comes out and is connected electrically is desirable. Since a counterelectrode 225 is formed by ITO, its sheet resistance is [this] high. Therefore, it is for connecting BM224 which consists of ITO and the metallic material of a counterelectrode 225, and making sheet resistance low. What is necessary is for etching etc. to remove smoothing film 227a of the part where BM224b and a counterelectrode 225 touch, and just to constitute so that BM224b and a counterelectrode 225 may touch directly when connecting within a viewing area. As for the case of this configuration, BM224b selects ingredients other than aluminum. It is for preventing the corrosion by the cell.

[0275] It is good to constitute on the other hand, so that smoothing film 227b may be formed on the source signal line 228 and the pixel electrode 230 may adjoin on the source signal line 228 in the array substrate 221 side. Thus, by constituting, the optical leakage from the periphery of the pixel electrode 230 is completely lost.

[0276] However, the parasitic capacitance of the source signal line 228 and the pixel electrode 230 becomes large in this case. In order to avoid the bad influence to the image display by this parasitic capacitance, it is good to reverse the polarity of the video signal impressed between the pixels which adjoin in a longitudinal direction. In addition, in (drawing 23), the structure of TFT241 etc. unnecessary to explanation is omitted. Moreover, TFT241 is good to make it LDD (low doping drain) structure.

[0277] When smoothing film 227b which becomes the array substrate 221 from an inorganic material after forming TFT241 etc. is formed with inorganic materials, such as SiO₂, after formation grinds smoothing film 227b, a front face is ground, and it graduates. Polish processing is performed mechanically chemically or electrically like smoothing film 227a. Especially when smoothing film 227b is formed by SiO₂, since SiO₂ is comparatively soft, mechanical polish is easy for it.

[0278] After performing polish processing, the contact hole which connects TFT241 and the pixel electrode 230 to smoothing film 227b is formed, and the pixel electrode 230 is formed on smoothing film 227b. In addition, when performing polish processing for the smoothing film 227 also in organic materials, such as polyimide, it cannot be overemphasized that good smoothing film 227b can be formed. Moreover, on TFT241, a light-shielding film is formed with the metal of the source signal line 228 or a gate signal line, and it shades so that light may not carry out incidence to TFT241.

[0279] In order to make the liquid crystal layer 236 into predetermined thickness, the column 245 which consists of dielectric materials or a conductor ingredient is formed on the array 221 which meets BM224 top or BM224 (drawing 24). Let the height of a column be the thickness of the liquid crystal layer 226.

[0280] In addition, as illustrated to (drawing 22), it is good for a display panel 21 to form an antireflection film 229 or to carry out optical coupling of the acid-resisting substrate 1111 by the optical coupling material 126 (drawing 111 (a)).

[0281] Thus, by constituting, the light reflected by the interface of a display panel 21 and air is controlled, and efficiency for light utilization improves.

[0282] Moreover, even if dust adheres to the front face of a display panel 21, there is also an advantage of not carrying out image formation on a screen. The (drawing 111 (b)) is the configuration of having attached the micro-lens substrate 1112 in the display panel 21, and the (drawing 111 (c)) is the configuration of having attached the acid-resisting substrate 229 in the micro-lens substrate 1112.

[0283] In addition, in (drawing 23), the pixel electrode 230 may not be limited to a transparency mold, and a reflective mold is sufficient as it. Moreover, as indicated in the case of the reflective mold (drawing 126 drawing 131), you may make it the shape of the teeth of a saw. Moreover, as indicated to (drawing 27), it is good also as a transreflective specification.

[0284] (Drawing 23 (a)) It cannot be overemphasized that the display panel 21 of this invention explained by - (drawing 23 (c)) can be used only as a light valve of a projection mold indicating equipment also as display panels, such as Personal Digital Assistants (drawing 93), such as a light valve of the drawing 150 Viewfinder of this

invention etc. or a head mount display, and a video camera of (drawing 91), a personal computer of (drawing 100), or a liquid crystal television. As mentioned above, it cannot be overemphasized that the display panel of this invention is diverted to the graphic display device of other this inventions etc., and can be constituted freely.

[0285] (Drawing 24) is the configuration which formed addition capacity in the opposite substrate 222 side in addition to the configuration of (drawing 23). An insulator layer (dielectric film) 246 is formed on a counterelectrode 225, and the addition capacity (storage capacitance) electrode 247 is formed on the insulator layer 246. That is, the capacitor is formed by using a counterelectrode 225 and the addition capacity electrode 247 as an electrode.

[0286] The addition capacity electrode 247 and the drain terminal 244 are connected by the connection 245 which consists of conductor ingredients, such as a metal. Therefore, the addition capacity of each pixel will be formed on the counterelectrode. In addition, the electrode of addition capacity is not limited to the addition capacity electrode 247 and a counterelectrode 225, and is good also as the addition capacity electrode 247 and BM224. Moreover, the addition capacity electrode 247 may be formed with transparent electrodes, such as ITO, and may be formed with a metallic material.

[0287] A connection 245 functions also as a spacer which maintains the liquid crystal layer 226 at predetermined thickness. Moreover, a connection 245 may form carbon etc.

[0288] Addition capacity is formed in the opposite substrate 222 side as mentioned above because it becomes impossible to take the spacer which forms addition capacity in the array substrate 221 side when pixel size becomes small. Of course, addition capacity may be made into trench structure and may be formed in an array substrate side. However, with trench structure, since structure is complicated, a manufacturing cost becomes high and the technical problem that the manufacture yield falls occurs. However, it may be unable to adopt. In addition, the addition capacity of both by the side of an array substrate and an opposite substrate may be formed.

[0289] On the other hand, the opposite substrate 222 top does not have a counterelectrode 225 and structures other than BM224, and a counterelectrode 225 is a solid ground electrode and has the advantage that potential is stable.

[0290] As for the addition capacity electrode 247, it is desirable to make it in agreement with BM224 formation location, and to form, as shown in (drawing 25). Even if it forms the addition capacity electrode 247 with a metallic material, it is because a numerical aperture does not fall. Of course, when forming the addition capacity electrode 247 with transparent electrodes, such as ITO, it can cross throughout pixel size and the addition capacity electrode 247 can be formed.

[0291] A connection 245 is formed so that it may become the dotted-line section of (drawing 25). When the addition capacity electrode 247 is formed by ITO etc., since it is hard, it can be hard to take contact to a connection 245 and ITO. Therefore, it is desirable to form in the part which takes a connection 245 and contact with comparatively soft metallic materials, such as aluminum.

[0292] (Drawing 26) is the representative circuit schematic of the configuration of (drawing 24). TFT241 is formed near the intersection of the source signal line 228 and the gate signal line 261. The source terminal 243 of TFT241 is connected with the source signal line 228, and the gate terminal 242 is connected with the gate signal line 261. The drain terminal 244 of TFT241 is connected to the pixel electrode 230 and the connection 245. Moreover, the drain terminal 244 is connected with the pixel electrode 230. One common electrode of addition capacity and a liquid crystal layer is a counterelectrode.

[0293] Moreover, if a counterelectrode 245 is separated as 245a and 245b as shown in (drawing 26 (b)), a signal or an electrical potential difference can be impressed to one [addition capacity and] electrode of liquid crystal according to an individual.

[0294] That is, the signal reversed in every field (frame) is impressed to a or b terminal. The potential of the pixel electrode 230 can be operated by impressing a signal to a or b terminal. Therefore, the signal which will impress the pixel electrode 230 to the source signal line 228 if a signal is impressed so that the standup electrical potential difference (1.0V-3.0V) of liquid crystal may be impressed is low for a or b terminal by the standup electrical potential difference, and can be made it. Therefore, since signal amplitude of the source driver IC can be made small, power consumption can be reduced.

[0295] Although examples (drawing 24), such as (drawing 22) and (drawing 23), explained the pixel electrode 230 as a transparent electrode which consists of ITO etc., it cannot be overemphasized that you may be the reflector or reflective film with which the reflector with which it does not limit to this and the pixel electrode 230 consists of a metal etc. is sufficient with the film, and a counterelectrode consists of a metal or dielectric interference film. The display panel of this invention explained on these specifications as mentioned above can consist of a transparency type, a reflective type, or all.

[0296] (Drawing 27) is an example in case a pixel 230 is a reflective mold. However, it has opening 272 in a part of reflective pixel. From this opening, the light from a back light 16 permeates and it can also use also as a transparency mold. When especially the liquid crystal layer 226 is PD liquid crystal, a polarizing plate is unnecessary to light modulation. Therefore, an image can be enough displayed also by the small opening 272. Moreover, when ** also reflects outdoor daylight by the reflective film 273 not using a back light, it can use as a display of a reflective mold.

[0297] In addition, in (drawing 27), although the color filter 223 is formed in the interior of a display panel 21 (liquid crystal layer side), it may form or arrange a color filter 223 to the exterior (field which touches air) of a display panel 21.

[0298] The reflective film 273 is formed with aluminum (aluminum), chromium (Cr), a metal (Au), or silver (Ag) in the

front face. Moreover, two or more metallic materials, such as titanium (Ti) and chromium (Cu), are formed in the shape of a layer for the reason for raising adhesion with a substrate 221 etc. Moreover, what vapor-deposited the ITO electrode on the interference film which consists of dielectric multilayers is sufficient as the reflective film 273. [0299] The insulator layers 246, such as SiO₂ and SiN_x, are formed in the front face of the reflective film 273 by 0.1-micrometer or more thickness 1 micrometer or less. The pixel electrode 230 which consists of ITO is formed on this insulator layer 246. This pixel electrode 230 is connected with the drain terminal of TFT as a switching element 241 as shown in (drawing 24).

[0300] On the other hand, the reflective film 273 functions also as a common electrode. Therefore, the reflective film 273 is electrically connected by the periphery of a display panel 21 so that it may become the potential of a common electrode. The potential of this common electrode is the potential of a counterelectrode 225 usual. Moreover, when dielectric multilayers consider as the reflective film, the transparent electrode (ITO) formed in the lower layer or the upper layer of these dielectric multilayers turns into a common electrode.

[0301] Moreover, a reflector 273 is the uniform film except opening 272. That is, it has the shape of a solid electrode which counters common to each pixel electrode 230. Of course, the configuration that leave not the thing to limit in the shape of a solid electrode but some connections, patterning may be carried out so that it may correspond to each pixel, and patterning of the reflective film 273 was carried out by making two or more pixels into a group may be used.

[0302] In addition, the reflective film 273 or the whole pixel electrode may be used as a transparent electrode by forming metal thin films, such as aluminum and Cr, thinly at the shape of a half mirror. In this case, it is not necessary to form opening 252 separately. It is because it is half-transparency as a whole.

[0303] Moreover, minute heights are formed in the reflective film 273 or the pixel electrode 230 by the metal thin film or the insulator layer. Or a minute crevice or heights is formed by etching said film. The metal thin film used as a reflector is formed in these concave or heights by vacuum evaporation, and it considers as a reflector. or said concave heights top -- an insulator layer etc. -- one layer -- or two or more layers are formed and a reflector is formed on it.

[0304] By forming a metal thin film in concave or heights as mentioned above, inclination sticks moderately and the level difference of concave or heights can form the concave heights which change smoothly. Thus, the angle of visibility of a display panel is expandable by constituting. In addition, as for concavo-convex height, it is desirable to be referred to as 0.2 micrometers or more 1.5micro or less.

[0305] Moreover, even if it is the case where a pixel electrode is a transparency mold, it is effective to form the ITO film in piles and to form a level difference. It is because incident light diffracts with this level difference and display contrast or an angle of visibility improves.

[0306] In addition, the hole of the light which a hole 272 does not mean only a perfect hole and has light transmission nature is available for the configuration which forms a hole 272 in a reflector 273. The hole of light means that it has light transmission nature. For example, it is the hole which has light transmission nature, such as ITO. A metal thin film is formed on an ITO electrode, said metal thin film is etched and a hole 272 is formed. From this hole 272 of ITO, outgoing radiation of the light from a back light is carried out. A metal thin film reflects outdoor daylight. Moreover, ITO and a metal thin film carry out light modulation of the liquid crystal 226 with the impressed electrical potential difference.

[0307] Storage capacitance 262 is constituted by the above configuration by using the pixel electrode 230 and the reflective film 273 as an electrode. Therefore, the reflective film 273 has a pixel in accordance with the function used as a reflective mold, and the function as storage capacitance 262.

[0308] In addition, in (drawing 27), it is thickly [part / of A] high in color purity, and the part of B is thin, or the color filter 223 forms color purity low. It is because the light from opening 272 carries out incidence of the part of A. That is, since the part of A is a part which functions as a transparency mold, it needs to make color purity of a color filter high. Since the part of B is a part which functions as a reflective mold, incident light penetrates a color filter 223 twice. Therefore, as compared with the case of a transparency mold, one half of thickness can also hold the same color purity. Therefore, the thickness of a color filter 223 is good in it being thin. Or even if color purity is low, it is good in optical limit width of face being wide. That is, a center section is thick and a color filter 223 forms a periphery thinly.

[0309] Therefore, in the display panel of a transreflective specification, what formed thickness distribution of a color filter corresponding to the location of opening 272, or formed color purity or spectral distribution is adopted.

[0310] (Drawing 27 (b)) is the representative circuit schematic of (drawing 27 (a)). Liquid crystal is pinched between the pixel electrode 230 and a counterelectrode 225, and it has become one capacitor, and has storage capacitance (capacitor) 262 by using the pixel electrode 230 and the reflective film 251 as an electrode.

[0311] In addition, other switching elements, such as a thin-film diode (TFD) or a varistor, are sufficient as TFT271. Moreover, it does not limit and two or more switching elements 271 may be connected [one]. Moreover, as for TFT, it is desirable to adopt LDD (low doping drain) structure.

[0312] In addition, the structure where a display panel can be used also with a reflective method or the transparent mode is called a transreflective method in this way.

[0313] In addition, what considered the pixel electrode as the half mirror configuration is contained in a transreflective method. For example, there is a method which vapor-deposits Cr etc. thinly to the pixel electrode which consists of ITO, and constitutes it in it.

[0314] In addition, in the graphic display device of a transreflective specification, what the electrical potential

difference impressed to the liquid crystal layer 226 in the time of using a display panel 21 in reflective mode and the time of using it by the transparent mode is changed for (the (electrical-potential-difference V)-liquid crystal layer transparency (T) property of driving a liquid crystal layer is changed) is effective. It is because the directivity of incident light etc. differs and a display condition changes in the time of using it in the state of the time of using the liquid crystal display panel 21 as a transparency condition, and reflection.

[0315] When using it in the state of transparency generally, in order to mainly use forward scattering, it is necessary to improve the dispersion condition of a liquid crystal layer etc. Therefore, the electrical potential difference impressed to the liquid crystal layer in the maximum white display in a normally white mode is made low (it starts and carries out to below an electrical potential difference). For example, it starts, and it will be made 1.8V etc. if an electrical potential difference is 2V. Conversely, it starts, and carries out to carrying out more than an electrical potential difference 2.5V etc., the dispersion property of the liquid crystal layer 226 considers the condition of having fallen for a while as the maximum white display, and a V-T property (gamma curve) is set up.

[0316] When using with a reflective mold, in order to use both a backscattering and forward scattering, the electrical potential difference impressed to a liquid crystal layer by the maximum white display is made higher than the time of using in the state of transparency (it carries out more than the standup electrical potential difference of a liquid crystal layer). This change is performed by making it the power-source on-off switch of a back light interlocked with. Depending on the class of liquid crystal display panel, and the mode, the applied voltage in the maximum white display or the maximum black display differs. This setup becomes reverse in a normally white display and a normally black display (it carries out).

[0317] Anyway, the technical thought indicated on these specifications is changing a V(applied voltage)-T (permeability) property in the time of using the time of using a transfective specification display panel in the state of transparency (transparent mode) in the state of reflection (reflective mode).

[0318] The change of a V-T property creates beforehand ROM for transparency conditions, and ROM for reflective conditions, and what (a ROM address is switched) a required electrical-potential-difference value is changed for on a ROM table can realize easily. Of course, the change of this ROM address may be interlocked with the power-source on-off switch of a back light. Moreover, turning on a back light auxiliary, although a display panel 21 may be used with a reflective mold, then another ROM may be prepared and set (incorporating). Moreover, it is desirable to change a V-T property (gamma curve) according to the lighting reinforcement of a back light and the lighting reinforcement of outdoor daylight.

[0319] If modification of a gamma curve detects reinforcement, such as outdoor daylight, by the phot sensor, and the detected data are processed on a data-processing means or ROM tables, such as CPU and a microcomputer, and are performed, it is easy. Moreover, the configuration or method which is interlocked with brightness BORUMU of the back light which an observer can change, and is changed is also considered.

[0320] Moreover, the mode which modulates the circular polarization of light is used for a liquid crystal layer. It is desirable to arrange a phase film to the optical incidence and the outgoing radiation side of a liquid crystal panel, and to operate the linearly polarized light. Moreover, a polarizing plate is independent, and combines and uses the film of a reflective mold and an absorption mold etc. With a natural thing, PD liquid crystal of polarizing plate loess etc. may be used.

[0321] Moreover, an observer's location or the location of an eye is detected by the camera and the infrared sensor, and you may make it change a gamma curve so that it may become the optimal contrast display and display brightness. Moreover, it is good, even if it judges the optimal display condition from the reinforcement of outdoor daylight etc. and changes a gamma curve from this judgment result dynamically or statically (even if it changes).

[0322] It is easily realizable if a phot sensor detects the quantity of light or the reflected light etc. which carries out incidence also of these configurations to a display panel 21. Moreover, it is also desirable to change a gamma curve according to the class of drive methods (1H reversal drive, a 1-dot reversal drive, 1 field reversal drive, etc.) of a display panel. It is easily realizable, if fastidious and you will make it a drive method changeover switch interlocked with. Moreover, a gamma curve may be changed by a normally white display and normally black display with a natural thing.

[0323] It is effective to display reinforcement, such as outdoor daylight, on the display of a display panel. With the reinforcement of outdoor daylight, although a back light should be used, it judges whether it is no and illustrates to an observer.

[0324] Moreover, or it makes it display it on a display panel as under lighting while turning on a back light, it is desirable to make an indicator lamp (annunciator) turn on (display) and to make an observer understand.

[0325] By approaching the light modulation layers 226, such as PD liquid crystal, and forming a scattering layer, it is large in the angle of visibility of a display panel, and display contrast can be made high. That is, a usual state scattering layer is formed in contact with the liquid crystal layer 226.

[0326] What added the titanium particle to the acrylic resin used in the liquid crystal layer 226 is illustrated as a usual state scattering layer. Moreover, what added the dispersion particle to what added the dispersion particle to the epoxy resin, gelatin resin, polyimide resin, Teflon resin, polyester resin, and urethane resin is illustrated. In addition, the ingredient of a different refractive index may be mixed or you may use. It is because it will become cloudy if the ingredient with which refractive indexes differ is mixed. In addition, the configuration of having stiffened acrylic resin, adding little liquid crystal to non-hardened acrylic resin, and holding a dispersion condition may be used.

[0327] The above-mentioned usual state scattering layer may use also [film / of (drawing 27) / orientation], and

it may form between the orientation film and a color filter 223, or it may be formed between the orientation film and the liquid crystal layer 226. Moreover, you may form before and after the pixel electrode 230. Moreover, it cannot be overemphasized that the above thing can apply to other this inventions.

[0328] Moreover, a usual state scattering layer may not be limited only to a solid-state, and gel and a liquid are sufficient as it. Moreover, three or more kinds of ingredients may be mixed. Moreover, a usual state scattering layer may be scattered by making not only a resin independent but liquid crystal contain. Since specific inductive capacity is large and it is hard to generate a voltage drop, liquid crystal is desirable. Specific inductive capacity is good to choose or more 5 ten or less ingredient. In addition, it is good also as a usual state scattering layer using opal glass etc. Moreover, what oxidized aluminum may be used.

[0329] It cannot be overemphasized that the matter about these gamma curves is applicable to other indicating equipments of this invention, a projection mold indicating equipment, or a head mount display. Moreover, it cannot be overemphasized that it is applicable also to the display panel of not the thing limited to a transfective type display panel but a reflective mold or a transparency mold and a display. Moreover, it is good also as a configuration which used the pixel electrode 230 whole as the transparency mold, and used the counterelectrode 225 as the reflector, and formed opening 272 in the part corresponding to each pixel of said reflector.

[0330] The opening 272 of the reflective film 273 is formed in the center section of the pixel 230 as shown in (drawing 28 (a)), and also it may be formed in a periphery like (drawing 28 (b)). Moreover (drawing 28 (c)) may be formed in the shape of a stripe like. In addition, it is good also considering the clearance between contiguity pixels as opening 272. constituting circularly. Moreover, it is good also considering the clearance between contiguity pixels as opening 272.

[0331] In the configuration of (drawing 28 (a)), considering physical relationship of a source signal line, a gate signal line, and the pixel electrode 230 as the relation of (drawing 153) contributes to the numerical aperture rise on parenchyma. It is because a pixel electrode is formed on protection-from-light matter, such as a source signal line, and this formed pixel electrode is used as a reflector.

[0332] As shown in the (drawing 153 (b)), the source signal line 228, the gate signal line 261, TFT that is not illustrated are formed on the array substrate 221. The smooth film 227 is formed on these. Moreover, the pixel electrode 230 is formed on the smooth film 227. The pixel electrode 230 is formed with a transparent electrode, and forms the reflective film 1531 which becomes the periphery of this transparent electrode from aluminum, Cr, Ag, or the interference film. The reflective film 1531 may be formed in the lower layer of the pixel electrode 230, or may be formed on the pixel electrode 230, or whichever is sufficient as it.

[0333] A reflector 273 is formed in a location which laps with source signal-line 228 grade. Since the source signal line 228 is formed with protection-from-light ingredients, such as aluminum, light does not penetrate it. A pixel formation field can be used effectively by forming a reflector on this field that does not carry out light transmission.

[0334] It is necessary to form both a reflective field and a transparency field in a transfective type display panel. As for a reflective field, it is natural not to penetrate light. On the other hand, the source signal line 228 does not penetrate light, either. Therefore, if a reflective field is formed on the source signal line 228, the field which can be used as a reflector will be expanded.

[0335] Moreover, it also sets to (drawing 153) and they are the pixel electrode 230 and the reflective film 273 (however, in this case, since it is functioning as a mere electrode, it does not limit to the reflective film.). Even if it is transparent electrodes, such as ITO, while it is good, it is desirable to constitute the addition capacity 262.

[0336] By piling up on the source signal line 228, as shown in (drawing 153), the electric field from the source signal line 228 can be shielded. Therefore, the abnormality orientation of a liquid crystal molecule is not generated. However, it is good to enforce the drive approach shown since the parasitic capacitance of the source signal line 228 and the pixel electrode 230 may become large in this case (drawing 30 (drawing 29)). The same is said of the configuration in which the pixel electrode has lapped with the source signal line (gate signal line) like this (drawing 134 (drawing 24 (drawing 23 (drawing 22)))). (Drawing 29) etc. -- the drive approach is explained later.

[0337] (Drawing 134) is the configuration which formed the color filter 223 in the array substrate 221 side. (Drawing 27) etc. -- **** -- although the color filter 223 was formed in the opposite substrate 222 side, the display panel of this invention etc. may not be limited to this, and as shown in (drawing 134), a color filter 223 may be formed in the array substrate 221 side.

[0338] As shown in (drawing 134), TFT241, a source signal line (not shown), etc. are formed in the array substrate 221. On the array substrate 221, in order to control the irregularity by TFT241 grade, the smoothing film 227 which consists of transperence resin is formed. It is the same as that of the matter about the quality of the material of the smoothing film 227, thickness, etc. (drawing 27 (drawing 23)). This smoothing film 227 is formed also on TFT241, and it functions also as an insulator layer while it turns into a protective coat of TFT241. The color filter 223 (R, G, B or cyanogen (C), yellow (Y), magenta (M)) in three primary colors is formed on the smoothing film 227. In addition, you may make it function as (drawing 23 (b)) having explained the color filter 223 as smoothing film. Moreover, the smoothing film 227 may be formed on a color filter 223, and a color filter 223 may be formed on the pixel electrode 230. In this case, the pixel electrode 230 is good also as a reflector.

[0339] A color filter 223 may be filled up with an optical dispersing agent, and moderate optical diffusibility may be given. Moreover, it is effective to also make an angle of visibility expand to the color filter itself by forming minute irregularity. Moreover, since a red color filter cannot take color purity easily, its little blue thing for which it is made to mix, and sees and the upper color purity is raised is also effective. Moreover, the color filter of three primary colors each may be formed in piles, and may be operated as BM in an adjoining part. Moreover, you may use as a spacer by making in agreement with the thickness of the liquid crystal layer 226 the thickness which accumulated

the color filter and was accumulated on the source signal line.

[0340] It can be made to function as electric-field shielding by forming a color filter in tops, such as a source signal line. Furthermore, the film which consists of a conductor can be formed on it, and the electric field from a source signal line can be completely shielded by fixing to predetermined potential. Therefore, cannot generate the optical leakage by the abnormality orientation of liquid crystal, and it can be carried out.

[0341] On TFT241, BM224 which consists of matter which made carbon black mix in an acrylic is formed. This BM224 shades the light which carries out incidence to TFT. In addition, the ingredient explained as BM224 (drawing 23 (drawing 22)) can be used.

[0342] However, if resin is formed, exfoliation will tend to generate BM224. Resin BM 224 is because adhesion is bad. Therefore, as shown in (drawing 134), the pixel electrode 230 is formed also on BM224. The pixel electrode 230 presses from BM224, and controls exfoliating. Moreover, the pixel electrode 230 covers a color filter 223 top while making it connect with the drain terminal of TFT241 through a contact hole.

[0343] In addition, a common electrode (drawing 27) (see the common electrode 274) may be formed on the array substrate 221, and a color filter 223 may be sandwiched between this common electrode and the pixel electrode 230. This common electrode and the pixel electrode 230 turn into an electrode of the addition capacity 262.

Moreover, a display panel can be made into a reflective mold or a transfective type while the same configuration as (drawing 27) is realizable by using this common electrode as the reflective film 273.

[0344] It is effective in improvement in a numerical aperture etc. to add the micro-lens array 1112 to a display panel 21. The configuration which added the micro-lens array 1112 is shown in (drawing 126).

[0345] First, before explaining (drawing 126), the projection mold display which used the display panel 21 of (drawing 126) as a light valve is explained using (drawing 124).

[0346] In (drawing 126), 21 is the display panel of this invention. A display panel 21 is formed in a reflective mold or a transfective type. Moreover, in order to cool a display panel, the heat sink 805 is attached in the rear face. As for a heat sink, cooling air is sprayed with a sirocco fan. Moreover, it may include in a case by making a polarization beam splitter (PBS) 871 and a display panel 21 into one, the inside of this case may be filled up with the hydrogen of two to 8 atmospheric pressure, and you may cool by making this hydrogen flow. Hydrogen is because refrigeration capacity is high. Moreover, you may cool by being filled up with alkaline water in a case. Since a display panel 21 and PBS871 are made one by optical coupling layer 126a, water does not permeate near the image formation side of a display panel 21, and even if water is heated and fluctuation arises, the strain of an image is not produced.

[0347] In addition, although (drawing 124) was set to cube-like PBS, it is not limited to this, and tabular PBS is sufficient as it, and it may not be limited to a polarization discrete type, and a dichroic mirror, a half mirror, etc. are sufficient as it. moreover, the optical coupling layer 1269 — not restricting — also carrying out — it is not required. However, the unnecessary reflection of efficiency for light utilization [a border and] improves by what (it arranges) is formed. Moreover, in PBS etc., the light absorption film or a light absorption member is attached in addition to the field through which a light effective in image display passes (invalid field). For example, it is applying a black coating etc. By forming a black coating etc., the light reflected irregularly in inside, such as dichroic mirrors, such as PBS, can be absorbed, and display contrast can be improved.

[0348] A polarizing plate (polarization film) 1241 is arranged in the optical outgoing radiation side of PBS871. Thus, display contrast can be raised by arranging a polarizing plate 1241 and making the polarization shaft of a polarizing plate 1241 in agreement with the polarization shaft of PBS871. A polarizing plate 1241 is directly stuck on PBS. Moreover, optical coupling layer 126b is arranged also between a polarizing plate 1241 and lens 795b. This optical coupling layer 126b functions also as an object for cooling of a polarizing plate 1241. moreover, optical coupling layer 126b — not preparing — between lens 795b and a polarizing plate 1241 — hydrogen — restoration — or it may be made to flow and polarizing plate 1241 grade may be cooled.

[0349] Incidence of the light 18 emitted from the discharge lamp 791 is carried out to a dichroic mirror 533. An ultrahigh pressure mercury lamp (UHP lamp), a metal halide lamp, a xenon lamp, and a halogen lamp are illustrated, in addition, as for a discharge lamp 791, a krypton lamp, a tungsten lamp, white LED, and a fluorescent lamp (lamp) are illustrated as small application expansion. It is reflected with a concave mirror (a parabolic mirror, ellipsoidal mirror) 792, and a part of light 18 emitted from the discharge lamp 791 is emitted to a front face.

[0350] Dichroic mirrors 533B, 533G, and 533R change an include angle to the direction of an incident angle of the main light game of light 18, respectively, and are arranged. Dichroic mirror 533B reflects blue (B) optical 18B, 533R reflects red (R) optical 18R, and 533G reflect optical 18G of green (G). Since dichroic mirrors 533B, 533R, and 533G change an inclination and are arranged, as for Light 18B, 18R, and 18G, the include angle of a chief ray changes.

[0351] (Drawing 125) is an explanatory view for explaining the description of the block diagram of the conventional display panel, or the display panel of this invention. Incident light 18B shown in (drawing 124) is set to 18a1, incident light 18R is set to 18b1, and incident light 18G are set to 18c1.

[0352] One micro-lens 18b is arranged corresponding to three reflectors 230a, 230b, and 230c. Since incidence of the incident light 18b1 is carried out perpendicularly, it turns into the reflected light 18b2 of the same path. Since incidence of the incident light 18b1 is carried out perpendicularly, it turns into the reflected light 18b2 of the same path.

[0353] In order to carry out incidence of the incident light 18c1 at an include angle theta 1 to reflector 230c, it turns into the reflected light 18c2, and on the other hand, in order to carry out incidence of the incident light 18a1 at an include angle theta 2 to reflector 230a, it turns into the reflected light 18a2. Therefore, although incidence of the reflected light 18b2 is again carried out to a micro lens 186, incidence of the reflected light 18a2 and 18c2 is not

carried out to a micro lens. Incidence of saying [not carrying out incidence] will be carried out to a projector lens 797 through PBS871. Therefore, in the projection mold indicating equipment of (drawing 124), color balance is not maintained or efficiency for light utilization gets very bad.

[0354] In order to cope with this technical problem, the display panel of this invention gives and constitutes the predetermined include angle θ_3 in Reflectors 230a and 230c, as shown in (drawing 126). in addition -- drawing 126 etc. -- although it sets and a drawing is two-dimensional [-like], it cannot be overemphasized in fact that reflector 230 grade may be formed in the shape of 3rd curve. Moreover, a micro lens 186 is not limited in the shape of a SHIRINIDORI cull lens, either, and it cannot be overemphasized that a single lens or a biconvex lens is sufficient. Moreover, although what is necessary is just to constitute a micro lens 186 so that it may have forward power, what has negative power depending on the case may be adopted, or you may use combining a micro lens with forward power and negative power.

[0355] The include angle θ_3 (DEG.) of Reflectors 230a and 230c is set to $2 \leq \theta_3 \leq 12$, and is preferably set to $3 \leq \theta_3 \leq 8$. Moreover, in case the inclination of a reflector forms the smoothing film 246, it is formed using the La Stampa technique, or should just form a glass substrate 221 using chemical etching or a mechanical polish technique.

[0356] By leaning and forming Reflectors 230a and 230c, as shown in (drawing 126), the path 18a2 the same [incident light 18a1] or similar will be passed, and, as for the reflected light 18c2 of incident light 18c1, a chief ray will pass the similar or same path similarly. Therefore, since incident light 18a2, 18b2, and 18c2 will carry out incidence also of any to a micro lens 186 again, they can raise efficiency for light utilization sharply.

[0357] In addition, although it considers as the magnitude of an include angle with same include angle θ_3 of reflector 230c and include angle θ_3 of reflector 230a, it may not limit to this, and you may make it change in (drawing 126). Moreover, an include angle may be given also to reflector 230b. Moreover, eccentricity of the include angle of a reflector 230 may be carried out.

[0358] A configuration of being more concrete (drawing 126) is illustrated in the drawing Fig. of (drawing 127). In (drawing 127), the micro-lens array 183 forms a micro lens 186 by La Stampa, forms the heights of a micro lens 186, and is carrying out the mold of the crevice with low melting glass 1271. As for the focal distance of a micro lens 186, it is desirable that it takes 2.5 or more times for 5 or less times of the diameter (or diagonal length) of a micro lens in air. in order [in addition,] to raise color purity further -- a counterelectrode 225 top -- or it is desirable to form a color filter on the pixel electrode 230.

[0359] However, as shown in (drawing 127), when it constitutes, the thickness of the liquid crystal layer 226 differs. If thickness differs, color nonuniformity will arise, or light modulation effectiveness is reduced. For example, it will differ from the thickness t_1 of reflector 230b, and the thickness t_2 of the edge section of reflector 230c. It is the configuration of (drawing 128) which was coped with in this technical problem. The smoothing film 227 is formed on a reflector 230. Thus, liquid crystal thickness 226 can be made into fixed thickness by constituting. The smoothing film 227 of (drawing 128) may be transposed to a color filter. Moreover, irregularity may be formed so that spacing with a reflector 230 may be made uniform at the opposite substrate 222.

[0360] In the configuration of (drawing 128), if the refractive index of the smoothing film 227 is made higher than the liquid crystal layer 226 (drawing 129), as it is shown, in case it becomes a low include angle when incidence is carried out to the smoothing film 227, and it reflects with a reflector 230 and incident light 18a carries out outgoing radiation of the smoothing film 227 again, it can also be made into 18d of outgoing radiation light near almost perpendicularly. Therefore, it is desirable to make the refractive index of the smoothing film or less [0.05 or more] into 0.2 to the fluorescence refractive index of the liquid crystal layer 226. It is desirable to carry out to 0.15 or less [further 0.08 or more].

[0361] However, although the thickness of the liquid crystal layer 226 becomes fixed also in a configuration in (drawing 128), the technical problem that distance differs, respectively generates even each pixel electrode 230 and a counterelectrode 225. If distance differs, strength will arise in the applied voltage to the liquid crystal layer 226. This is directly linked with poor light modulation.

[0362] The configuration to this technical problem is a configuration of (drawing 130). The pixel electrode 230 is formed with the transparent electrode. The reflective film 273 insulated by the smooth film 227 is formed in the lower layer of the pixel electrode 230.

[0363] First, in order to form the irregularity of the reflective film 273, low melting glass and photo-curing resin are applied to the array substrate (silicon based substrate) 221. Besides the La Stampa technique is used and irregularity is formed. Concavo-convex immobilization is performed by irradiating heating or light. 246 is photo-curing mold resin, and when the array substrate 221 is transparence, the concavo-convex film 246 which is photoeffect mold resin should just irradiate ultraviolet-rays light from the direction of A on the back. In the case of light impermeability material, such as a silicon substrate, the array substrate 221 needs to use [the La Stampa member] the thing of a heat-curing mold or a room-temperature-setting mold for 246, using the thing of a light transmission mold.

[0364] The reflective film 273 which consists of aluminum, Ag, Au, or dielectric multilayers is formed on the concavo-convex film 246. In the case of aluminum, thickness is formed in 0.6 micrometers or more 1.6 micrometers or less. However, in order to make adhesion with the concavo-convex film good, on the concavo-convex film 246, other matter, such as Ti and Cr, is made to mediate and aluminum of the reflective film, Ag, etc. are formed on it.

[0365] The smoothing film 227 is formed on the reflective film 273. By (drawing 22) etc., since it is explaining (drawing 23), the component of the smooth film 227, the smoothing approach, etc. are omitted. It is the same

contents configuration, a method or similar contents, a configuration, and the method that are indicated by the same names, such as the same sign and a notation, etc. in above this inventions. Moreover, it is possible to refer to timely and to grasp the contents etc.

[0366] The pixel electrode 230 which consists of a transparent material on the smoothing film 227 is arranged. A color filter 223 is formed for moreover (drawing 130) if needed on a counterelectrode 225, the bottom of a counterelectrode 225, or on the pixel electrode 230 like.

[0367] By constituting, as shown in (drawing 130), while the liquid crystal thickness 226 serves as homogeneity, the electrical potential difference impressed to the liquid crystal layer 226 also serves as homogeneity. In addition, it cannot be overemphasized that considering as the shape of a three dimension is desirable as for the reflective film 273. Moreover, in order to use it as an electrode of addition capacity, as for the reflective film 273, holding to common electrode potential is desirable.

[0368] A configuration of being more concrete (drawing 130) is constituted as shown in (drawing 131). In the (drawing 131 (a)), TFT241 is formed on the array substrate 221, and the drain terminal and the reflective film 273 of TFT241 are connected by connection 245a. Furthermore, it connects by connection 245b through the contact hole opened in smoothing film 246b in the pixel electrode 230. Therefore, let the reflective film 273 and the pixel electrode 230 be the same potentials with the configuration of the (drawing 131 (a)). In this case, addition capacity can be constituted by using this electrode and the reflective film 273 as an electrode by forming in the part of C of the (drawing 131 (a)), and making this into a common electrode.

[0369] On the other hand, the hole is made in the reflective film 273 with the configuration of the (drawing 131 (b)). The drain terminal and the pixel electrode 230 of TFT241 are directly connected electrically by the connection 245 through this hole. The reflective film 273 is made into common potential, and constitutes addition capacity by using the reflective film 273 and the pixel electrode 230 as an electrode. As the dotted line [further / (drawing 131 (b))] D shows, the addition capacity 2 which considered as the addition capacity which consists of reflective film 273 and a pixel electrode 230 by having used the reflective film 273 as the common electrode, and used the reflective film 273 and a dotted line D as the electrode is constituted by forming the electrode connected with TFT241 in electrode. Therefore, sufficient addition capacity is producible.

[0370] In addition, as shown in (drawing 132), the minute heights 1321 may be formed on the reflective film 273. the minute heights formed on the pixel electrode 230 or the reflective film 273 -- also being related -- etc. (drawing 22 (drawing 23)) etc. -- since it is explaining, explanation is omitted. Moreover, (drawing 133) uses the smoothing film as a color filter 223.

[0371] In addition, although the micro lens 186 was formed using the La Stampa technique, it does not limit to this and Nippon Sheet Glass Co., Ltd. is manufacturing, it cannot be overemphasized by the micro-lens array 183 that what was formed using the ion-exchange method like may be used.

[0372] moreover -- drawing 133 etc. -- it sets, although three reflectors 230 correspond to one micro lens 186, it does not limit to this, and it carries out and it cannot be overemphasized that two are sufficient as four or more being sufficient. Moreover, a reflector 230 or the reflective film 273 is made into the shape of a three dimension (hemispherical), the include angle to which a chief ray progresses the light from a micro lens 186 good is changed, and the technical thought of carrying out incidence to a micro lens 186 again is applicable even if it is the case where one pixel 230 or the reflective film 273 corresponds to one micro lens 186.

[0373] When using a display panel 21 with a reflective mold, there is a problem that incident light 18a shown in (drawing 22) reflects with the pixel electrode 230, and reflected optical 18b carries out direct incidence to an observer's eye 826. Especially, by the case where the liquid crystal layer 226 is PD liquid crystal, in the case of normally white (NW) mode, black and white of an image are reversed and are displayed. This phenomenon is generated even when a display panel 21 is a transparency mold. It is because optical 18c from a back light 16 may carry out incidence to an observer's eye 826 directly.

[0374] By this invention, the prism plate (sheet) 23 as shown in (drawing 135) at the optical plane of incidence of a display panel 21 is arranged to this technical problem. As for the prism plate 23, it is desirable to carry out optical coupling to a display panel 21.

[0375] The prism plates 23a and 23b are minded with few air gaps 1351, and are arranged. The air gap 1351 is held with the bead sprinkled in the air gap 1351. In addition, when the diagonal length of the pixel of the liquid crystal display panel 21 is set to d, as for thickness (spacing) a of the air gap 1351, it is desirable to satisfy a degree type.

[0376] $d/10 \leq a \leq 1/2$, and (formula 9)

Furthermore, $1/5 \leq a \leq 1/3$, and (formula 10)

It is desirable to satisfy *****. It is desirable to satisfy the conditions of the repeat pitch (formula 8 (formula 7)) of the heights of prism.

[0377] Moreover, for prism, the liquid crystal layer 226 and the include angle theta (DEG.) to make are $25 \leq \theta \leq 60$ degrees. (formula 11)

Carrying out is desirable and it is $35 \leq \theta \leq 50$ degrees further. (formula 12)

It is desirable to satisfy *****.

[0378] The prism plate 23 may add an optical dispersing agent, in order to color for color correction or to add some dispersion nature. In addition, embossing may be performed for the front face of prism plate 23a, and an antireflection film 229 may be formed. Moreover, optical coupling of the polarizing plate may be carried out to the flat-surface section of the prism plate 23. Moreover, maintenance of the air gap 1351 between prism 23a and 23b may use a fiber besides a bead. As for these beads and a fiber, it is desirable to use a black thing. In addition,

heights may be formed in the inclined plane of the prism plate 23, and the air gap 1351 may be held by these heights. Moreover, it is desirable to form an antireflection film 229 in the field which touches the air gap 1351.

Moreover, in each prism plate, it is desirable to form the light absorption film in the field (invalid field) which a light effective in image display does not penetrate.

[0379] As shown in (drawing 135), incident light 18a is not influenced by the air gap 1351, but carries out incidence to a display panel 21. Moreover, outgoing radiation light 18c from a display panel 21 is not influenced by the air gap 1351, either, but carries out outgoing radiation to it. On the other hand, originally total reflection of the optical 18b of the include angle which carries out direct incidence to an observer's eye 826 is carried out with the air gap 1351. Therefore, an observer's eye 826 is not reached. Moreover, if the light absorption film is formed in the part of A, the light reflected irregularly within the prism plate 23 will also be lost.

[0380] If the prism plate 23 which has the air gap 1351 as mentioned above is arranged to the optical outgoing radiation side of a display panel 21, the phenomenon in which an image is displayed in white can be decreased or extinguished. In addition, this is the case of the Lord, a reflective mold, or a transfective type panel. Since the light which carries out direct incidence to an observer's eye 826 by arranging the prism plate 23 between a display panel 21 and a back light 16 can be prevented, an image carries out [stop / *****] monochrome (NEGAPOJI) reversal of the case of a transparency mold similarly.

[0381] In addition, it may be [although the slant face of the prism plate 23 was made into the shape of a straight line in (drawing 135)] what is limited to this and be circular, or may be the spherical surface-like, or minute irregularity may be formed.

[0382] It cannot be overemphasized that it is applicable also about other prism plates of drawing 136 This invention of the matter about the above prism plate 23 and air gap 1351 grade etc., a display, etc.

[0383] Moreover, the prism plate 23 as shown in (drawing 136) may be arranged to the plane of incidence of a display panel 21. The prism plate 23 of (drawing 136) forms an aslant thin slit (this serves as the air gap 1351) in a transprence substrate rather than it calls it a prism plate. A slit 1351 is formed in a longitudinal direction in the shape of a stripe (horizontal stripe) to the display screen. In addition, a slit 1351 may be formed in the shape of a substrate eye. That is, it forms length and horizontally in the shape of a stripe.

[0384] As shown in (drawing 137), Light 18a and 18b goes straight on as it is, and carries out incidence to a display panel 21. Reflecting with a reflector 230, total reflection of the optical 18c which carries out direct incidence to an observer's eye 826 is carried out about the air gap 1351, and it becomes 18d of reflected lights. Therefore, the phenomenon in which the image of a display panel 21 is displayed in white is not generated.

[0385] The air gap 1351 may be secured with a bead 1381, as shown in the (drawing 138 (a)), and as shown in the (drawing 138 (b)), it may be formed by projection 181. Moreover, a low refractive-index ingredient may be used instead of the air gap 1351, and as shown in the (drawing 138 (c)), the low refractive-index ingredient 1382 and the high refractive-index ingredient 1383 may be formed by turns. In the high refractive-index ingredient 1383, ITO, TiO₂, ZnS, CeO₂, ZrTiO₄, HfO₂, Ta₂O₅, ZrO₂, or the polyimide resin of a high refractive index is illustrated, and, as for the low refractive-index ingredient 1382, MgF₂, SiO₂, aluminum 2O₃ or water, silicon gel, ethylene glycol, etc. are illustrated.

[0386] Moreover, for the air gap 1351 of (drawing 137), a liquid crystal layer and the include angle theta (DEG.) to make are 40 degrees. <= theta <= It is desirable to satisfy 80 relation. Furthermore, 45 degrees <= theta <= It is desirable to satisfy 65 relation.

[0387] In addition, polarization means, such as a polarizing plate, may be arranged in the front face or rear face of the prism plate 23. Moreover, it is good for the front face of the prism plate 23, or the front face of said polarizing plate to form the antireflection film 229 which consists of resin film of a dielectric multilayers ***** low refractive index (1.43 or less or more 1.35 refractive index). Furthermore, it is good to form minute irregularity, such as embossing, for the front face of prism 23. It is because it moves and **** is reduced. Moreover, it is desirable to form the light absorption film in the field through which a light effective in image display does not pass. That is, these matters are the same as that of (drawing 135).

[0388] Although the air gap 1351 shall be formed in the shape of a slit into the prism plate 23 with the configuration shown in (drawing 136), it cannot be overemphasized that you may constitute as shown in (drawing 139). In (drawing 139), it is the configuration which held the air gap 1351 and has arranged the rectangle-like prism plates 23a and 23b. A prism plate may arrange in addition (drawing 136) (drawing 139) between a display panel 21 and a back light 16, as (drawing 135) explained.

[0389] (Drawing 29) is the explanatory view of the drive approach of this invention. the display panel which also forms a viewing area, simultaneously source drive circuits, such as elevated-temperature polish recon or low-temperature polish recon, especially -- or (drawing 23) is effective in the configuration with which the source signal line 228 and the pixel electrode 230 lapped like. It is because parasitic capacitance is cancellable in the 2 fields (two frames). For example, in (drawing 22), if the video signal of reversed polarity is impressed to the source signal lines 228a and 228b, the pixel electrode 230, the parasitic capacitance between source signal-line 228a, and the parasitic capacitance between the pixel electrode 230 and source signal-line 228b are because the potential of opium poppy ***** and the pixel electrode 230 stops changing inside. However, when a pixel color is the three primary colors (three kinds) in the drive method of this invention, it becomes one period by 3x2=6 frame.

[0390] As a fundamental drive method, it is as follows.

(1) In one pixel line, the same polar video signal is impressed to the pixel of the same color.

(2) One color makes reversed polarity other two colors and the polarity of the video signal to impress among colors

in three primary colors.

(3) Although the polarity of the video signal impressed to a pixel for every frame is reversed, one color impresses the six same polar video signals with the 1st frame and the 1st following frame once.

[0391] The color filter 223 of R, G, and B (or cyanogen, yellow, magenta) in three primary colors is formed in the display panel 21. The condition of the video signal impressed to the pixel 230 at this time is shown in (drawing 155). In addition, in order to give explanation easy, "+" and the case of being low are illustrated for the case of an electrical potential difference higher than the signal core shown in (drawing 155) as "-." Moreover, (drawing 155) sets and a pixel line writing direction and a lengthwise direction are made into the direction of a pixel train for a longitudinal direction. Sequential impression of the video signal is carried out per line.

[0392] In the (drawing 155 (a)), as for the pixel 230 of R and B, the video signal of "-" is impressed in the pixel line of arbitration, as for the pixel 230 of "+" and G. Therefore, it is "+---+---+---+" at the pixel line of arbitration.... "+" and a video signal are impressed. The (drawing 155 (b)) is in the video-signal impression condition of the pixel of one frame after. As for the pixel 230 of "-" and G, the video signal of "+" is impressed in the (drawing 155 (b)), and the pixel 230 of R and B is [---.... "+" and a video signal are impressed.] "-+ at the pixel line of arbitration. --- It is +. - - It is +. --- It is ++. That is, the (drawing 155 (a)) and the (drawing 155 (b)) are reversed polarity. Moreover, the polarity of the video signal currently impressed to the pixel 230 is reversed in the (drawing 155 (a)) (drawing 155 (b)). Therefore, since an AC signal is impressed to the liquid crystal layer 226, liquid crystal does not deteriorate. [0393] Originally, the polarity of the video signal impressed in the pixel line of arbitration is "+---+---+---.... Considering as "+" is most desirable. However, it is necessary to drive so that the "-" electrical potential difference may be impressed to realizing this R pixel 230 of one-line five trains, if R pixel 230 of the one-line one train of the (drawing 122 (a)) is "+."

[0394] If it is going to realize this drive approach, the clock which samples a pixel will become very quick. Moreover, it is necessary to perform the polarity reversals of a video signal at a high speed in the source driver circuit connected to the source signal line. Improvement in the speed has a big capacity in a source signal line, and is accompanied by difficulty. Moreover, it is necessary to make mobility of a source driver circuit high, or to enlarge driver circuit size. Therefore, the clock frequency of a drive circuit becomes high and this drive approach has many technical problems, when a drive circuit is produced with elevated-temperature polish recon or a low-temperature polish recon technique. Moreover, since components also with a high-speed video-signal processing circuit are required, it becomes expensive.

[0395] By the drive approach of (drawing 155), the polarity of each video signal of R, G, and B does not change within a 1 horizontal-scanning period (1H, i.e., one line). For example, (drawing 155 (a)), the period of 1H of the pixel of R of a party eye is the "+" polarity all the time. Therefore, low-temperature polish recon is also easily realizable. However, it is "+---+---+---+" at a 1-pixel line. ---. Since the polarity of the video signal of the pixel which adjoined "+" is identitas, it is easy to produce a flicker. However, if the polarity of the video signal impressed to a pixel 230 for every frame like the (drawing 155 (a) and (b)) is reversed, it is hardly generated and a flicker can be carried out.

[0396] (Drawing 29) shows (drawing 155) more concretely. It explains by adding the signal state and parasitic capacitance 291 which are impressed to the source signal line 228. Parasitic capacitance 291 is generated mainly by association with the source signal line 228 and the pixel electrode 230. In addition, the mark which fits in in (drawing 29) shows TFT241. Moreover, (+) shows the polarity of the video signal impressed to the source signal line 228 at the time of +, and (-) shows it at the time of -. Polar +- is usually based on the potential of a counterelectrode 225.

[0397] In (drawing 29 (a)), the condition of the (drawing 155 (a)) corresponds and, as for (drawing 29 (b)), the condition of the (drawing 155 (b)) corresponds. in addition, drive sequence --- (--- drawing 29 (1)) --- the condition of the 1st frame --- then --- (--- drawing 29 (2)) --- the following condition of the 2nd frame --- (--- drawing 30 (3)) --- the condition of the 3rd frame next to the 2nd frame --- (--- drawing 30 (4)) --- the following condition of the 4th frame --- (--- for drawing 31 (5)), the condition (drawing 31 (6)) of the 5th frame is in the condition of 6th frame. The degree of (drawing 31 (6)) will be in the condition of (drawing 29 (1)).

[0398] In order to give explanation easy, it thinks that it is the same with parasitic capacitance 291a and 291b, and it is the amplitude of the video signal of + polarity. - Suppose that the amplitude of a polar video signal is the same. Therefore, since source signal-line 229a is the same magnitude since + polarity and 229b are - polarities, and, as for the pixel 230R1 of R of (drawing 29 (1)), the AC signal of antipole nature is impressed to a pixel 230R1 with parasitic capacitance 291a and 291b, parasitic capacitance 291 is canceled. Therefore, fluctuation of the potential currently impressed and held is not produced in the pixel electrode 230R1. Parasitic capacitance 291a and 291b is similarly canceled about pixel 230G1.

[0399] Source signal-line 229a of left part is + polarity, and since the source signal line of the right-hand side is also + polarity, B pixel 230B1, 230 B-2--- causes potential fluctuation. Moreover, with the following frame (drawing 29 (2)), since the polarity of the video signal of a source signal line on either side is the same - polarity, potential fluctuation is caused. However, due to + polarity, since the 2nd frame is - polarity, as a whole, the effect of potential fluctuation denies, and suits and the 1st frame cannot be easily conspicuous. By - (drawing 31 (6)), since the polarity of a video signal on either side is antipole nature, it is [further] furthermore (drawing 30 (3)) hard to be conspicuous.

[0400] Since [of G pixel 230G1, 230G2 ---] the polarity of the source signal line 228 of both ends is the same, potential fluctuation is caused, but since the video signal of reversed polarity is mutually impressed to the source signal line 228, it is hard coming to be conspicuous in (drawing 30 (3) and (4)) with other frames as a whole.

[0401] At it being the same (drawing 31 (5), (6)), it is 230R1, 230R2 R pixels. --- Since the source signal line of both

ends is the same polarity, potential fluctuation may occur, but since reversed polarity is impressed with other frames, it is satisfactory practically. however — (— the pixel 230R1 of drawing 30 (4)) — (— since the electrical-potential-difference polarity impressed to a pixel like the pixel 230R1 of drawing 31 (5)) becomes the same over two frames — some — a flicker is easy to be conspicuous. However, since the polarity of the electrical potential difference to hold differs from other pixels, there is no generating of a flicker as the panel 21 whole.

[0402] (Drawing 29) In — (drawing 31), the polarity of the source signal line of both ends is the same over two frames (for example, in (drawing 29 (1) and (2)), although considered as the source signal lines 229a and 229b of the both ends of a pixel 230B1, it does not limit to this.). For example, although the polarity was made into (+) to the video signal of the both-ends source signal line 229 of 230B1 and B pixels was made into (—) in (drawing 29 (2)) in (drawing 29 (1)) to it B pixels of polarities of the source signal line of the both ends of 230B1 are mutually made into reversed polarity, and the polarity of the source signal line of the both ends of G pixel 230G1 may be made to become the same polarity in (drawing 29 (2)). moreover — etc. (drawing 29) etc. — **** — although [the pixel electrode 230 of one pixel train] the same polar electrical potential difference is impressed altogether, it is not limited to this and shown in (drawing 32) — as — a stroke — the polarity of an electrical potential difference may be reversed for every behavior.

[0403] In addition, as for the condition of the 1st frame, then (drawing 32 (b)), (drawing 32 (a)) shows the condition of the 2nd following frame. Moreover, although [the above explanation] the polarity of the signal impressed to a source signal line for every frame is reversed, it may not limit to this and you may make it reversed for every field. However, by the liquid crystal display panel, since it is a progressive display, it is becoming a field = frame in most cases. Moreover, what is necessary is just to enforce the drive approach of — (drawing 29) (drawing 31) by making two pixel lines into one unit (making 2 pixels of the upper and lower sides into one unit), when impressing the same video signal to two pixel lines like a false interlace drive.

[0404] Moreover, the drive approach of this invention does not correspond only to stripe-like arrangement [pixel], and can also apply the display panel of the shape of a mosaic as shown in (drawing 33) (shifting 1/2 pixel, shifting 3/2 pixel, and shifting 3/4 pixel). Moreover, the drive approach of this invention is not applied only to a liquid crystal display panel, but can be applied also to EL display panel of an active-matrix mold. Moreover, a pixel color may not be limited to the three primary colors, and four or more colors and two colors are sufficient as it. moreover, the field — when switching and displaying the light of R, G, and B for every frame sequentially, there is no concept of a color filter. however, the field — it cannot be overemphasized that it is applicable also to a sequential panel.

[0405] Hereafter, the drive approach of the display of this invention of mainly improving an animation display condition etc. is explained.

[0406] (Drawing 34) is the block diagram of the display of this invention. The light guide plate 14 as a back light is divided into two parts, 14a and 14b, as one example. Fluorescence tubing 141a is attached in one side of light guide plate 14a, and fluorescence tubing 141b is attached in one side of light guide plate 14b. Specifically, fluorescence tubing 141b should just think that it is arranged in the upper part (surface) of a screen, and 141a is arranged at the lower part (lower side).

[0407] On a boundary line (part of A) with light guide plates 14a and 14b, in order to control the ON appearance of the light between light guide plate 14a and 14b, a gobo or a reflecting plate is arranged (not shown). However, the thing short as much as possible of spacing A is desirable. in addition — in (drawing 34) although light guide plates 14a and 14b are separated — not restricting — also carrying out — it does not limit to this, and one light guide plate is sufficient, and it could separate or more into three.

[0408] In order to make it hard to be visible to the optical outgoing radiation side of a light guide plate 14 in the boundary line of light guide plates 14a and 14b, diffusion plate 22 grade is arranged, and the prism sheet 23 is arranged.

[0409] (Drawing 135) is an explanatory view of the method of presentation. Fluorescence tubing 141a turns on (drawing 35 (a)), and 141b shows the condition of putting out lights. Therefore, the upper part of Screen 16 is [81] non-display, and the lower part will be in the display condition 82. As shown in the right figure of (drawing 35 (a)) in the condition of (drawing 35 (a)), 107a of the image display section of a display panel 21 is in an image rewriting way condition. It is the field where permeability change of liquid crystal ended image display section 107b in (drawing 35 (a)) from the above thing, and only this field is in the condition that an image appears.

[0410] On the other hand, in (drawing 35 (b)), fluorescence tubing 141b lights up and fluorescence tubing 141a is in a putting-out-lights condition. At this time, the lower part of the image display section 107 is in an image rewriting condition. That is, the method of presentation shown in (drawing 35) is rewriting the screen upper part, when the lower part of a screen is in a display condition, and when the upper part of a screen is in a display condition, a bottom of screen is in a rewriting condition. And the viewing area applicable to the part from which permeability became a predetermined value is made to turn on.

[0411] in addition (drawing 35 (drawing 34)), the thing limited to two fluorescence tubing dividing by a unit of 1/2 hour although it sets and the fluorescence tubing 141a and 141b is turned on by turns — it is not — the method of one — time amount lighting of 1/4 frame — carrying out — another side — 3/4 frame — it is good though time amount lighting is carried out. Moreover, by 1/4 frame time of each fluorescence tubing lighting up at a time, in a putting-out-lights condition is sufficient as both fluorescence tubing, 2/3 frame time of each fluorescence tubing lights up at a time, and, as for 1 / 2 frame time, the predetermined time of frame time is good also as a condition which both fluorescence tubing has turned on. However, the one of effectiveness where the lighting time amount of fluorescence tubing is shorter is [the improvement effect of a movie display] high. As for the time amount T1

which added the lighting time amount of two fluorescence tubing, it is desirable that liquid crystal display panel 1 screen satisfies the following relation to the time amount (frame time) t required for rewriting.

[0412]

$(1/4) \leq T1/t \leq 3/4$ (formula 13)

In an upper type, although a screen becomes dark so that the value of $T1/t$ becomes small, animation display capacity improves.

[0413] Moreover, in (drawing 35), although [the fluorescence tubing 141b and 141a] the light is switched on by turns, it may not be limited to this, and it may reverse up-and-down lighting like fluorescence tubing 141b→141a→141a→141b→141b—. However, a display panel 21 is controlled to rewrite the screen of the lighting location of fluorescence tubing, and hard flow also in this case. That is, the display direction of a screen becomes bottom [of top →] — the bottom of top →, and on bottom →. Moreover, it cannot be overemphasized that the fluorescence tubing 141 may be transposed to LED array 11 etc.

[0414] It cannot be overemphasized that the matter indicated above is applicable to other displays of this invention, the method of presentation, etc.

[0415] Although (drawing 34) was the configuration of having used two light guide plates 14a and 14b, (drawing 36) is a configuration which has arranged the fluorescence tubing 141b and 141a the surface and the lower side of one light guide plate. The light guide plate 14 is formed in the shape of [loose] a wedge. Therefore, incidence of the light from fluorescence tubing is efficiently carried out to a light guide plate, and a uniform light comes to be emitted from a light guide plate 14.

[0416] Fluorescence tubing 141b illuminates the part of light guide plate 14b, and fluorescence tubing 141a illuminates the part of light guide plate 14a. Therefore, a boundary line with light guide plates 14a and 14b can make it hard to be conspicuous, when processing the configuration of the part of B proper in the case of (drawing 36), although the assignment rate of (drawing 34) and a lighting part etc. is the same.

[0417] After (drawing 91) makes the rewriting rate of the display screen 107 constant twice or a high speed and rewrites one screen, it turns on the fluorescence tubing 141 and a display image is made visible [drawing 91]. First, the transmitted image data are stored in memory and time-axis conversion is carried out. For example, **** conversion is carried out.

[0418] (Drawing 37 (a)) is a condition in the middle of screen rewriting. Both of fluorescence tubing arranged to the both ends of a light guide plate is in a putting-out-lights condition. As for (drawing 37 (b)), an image is displayed for fluorescence tubing 141a of the screen 107 upper part on lighting. (Drawing 37 (c)) switches off the fluorescence tubing 141a and 141b again, and Screen 107 disappears. This condition is a black display. In (drawing 37 (d)), shortly, fluorescent lamp 141b of the lower side lights up, and an image is displayed. and — again (drawing 37 (a)) — from — it is repeated.

[0419] By the drive approach of (drawing 37), since fluorescent lamps 141a and 141b light up by turns (drawing 37 (drawing 37 (b)) (d)), the brightness inclination of a screen etc. is not generated. moreover — (— in order to perform a black display by drawing 37 (a) and (c)) — an image — going berserk — it becomes good. Therefore, good image display is realizable.

[0420] In addition, to say nothing of making coincidence turn on fluorescent lamps 141a and 141b, in (drawing 37 (b) and (d)), you may still be in the condition of (drawing 37 (b) and (d)) in the middle of image rewriting. As for a black display condition, it is desirable to secure the time amount of $1/4$ or more and $3/4$, as shown also in a formula 13.

[0421] Moreover, although it expressed when the black display was performed in the method of presentation of this invention, as for this black display, a screen says the condition of disappearing. Therefore, you may be a gray display and a blue back display is also included. Moreover, depending on the class of display image, you may be a white display.

[0422] The method of presentation of (drawing 38) is also effective. It sets to also set to (drawing 38) (drawing 38 (a), (c)), fluorescent lamp 141a lights up, and it considers as an image display condition a core [the screen upper part or near]. Moreover (drawing 38 (b), (d)), it sets, fluorescent lamp 141b lights up, and it considers as an image display condition a core [a bottom of screen or near].

[0423] In (drawing 38 (a)), as shown in drawing of a right-hand side train, the screen more than one half of a viewing area 107 has written and changed. Therefore, up one half has predetermined permeability (stationary display condition) completely. Moreover, in (drawing 38 (b)), viewing-area 107b is a steady state. the same — (— drawing 38 (c)) — upside viewing-area 107a — a steady state — becoming — **** — (— drawing 38 (d)) — lower viewing-area 107b — a law — it is in the ** condition.

[0424] As mentioned above, good image display is realizable by taking a synchronization for the image rewriting condition of a display panel 21, and blinking a back light.

[0425] It is the method of presentation in case the component 11 which emits light in the three primary colors, such as R, G, and B, as shown in (drawing 119) (drawing 117 118) has been attached and arranged. a display — the field — color display is performed sequentially.

[0426] As shown in the right-hand side Fig. of (drawing 119), as for the display screen, a sequential indication of red display image 107R, green display image 107G, and the blue display image 107B is given. Moreover, LED (light emitting device) arranged at the edge section or the rear face of a light guide plate lights up in the state of sequential scanning. As shown in the left-hand side Fig. of (drawing 119), the light emitting device of R turns on the display part of R image 107R of a right-hand side Fig. (82R), the light emitting device of G turns on the display part which is image 107G of G (82G), and the light emitting device of B turns on the display part of image 107B of B

(82B). the luminescence field 82 of R — the luminescence field 82 of R and B — between luminescence field 82B of luminescence field 82G and B of B and G, and the luminescence field 82 of B — it is the astigmatism LGT field 81 (the field to which light is not emitted from a back light 16, or field where an image is not displayed on a display panel 21) between luminescence field 82G of B and G.

[0427] Therefore, an image display condition is displayed as R display → black display → G display → black display → B display → black display → R display → — in the location of the arbitration of a display panel 21. Under the present circumstances, the black display period k is $[T, \text{then}] \frac{1}{4} \text{ and } T \leq k \leq \frac{3}{4}$, and T about a R display + black display period (or a G display + black display period, a B display + black display period). (formula 14)

It is desirable to satisfy *****.

[0428] The above example was what makes some display screens a display condition by blinking light emitting devices, such as a fluorescent lamp 114. (drawing 39) always turns on a back light 16 — making — a part of light from this back light 16 — shading — some display panels 21 — it enables it to observe the image of a field Of course, a back light may be blinked or you may combine with changing a luminous-radiation field into a scan condition.

[0429] In (drawing 39), display-panel 21b controls an optical outgoing radiation field. Display-panel 21b possesses two or more scan electrodes 393 formed in counterelectrode 225b which consists of a solid electrode, and a pixel line writing direction in the shape of a stripe. Although the scan electrode 393 may form the number corresponding to a pixel line, one scan electrode 393 is usually formed within a 200-pixel line more than a 10-pixel line. Or when the number of perpendicular pixels of a display panel 21 is set to N , it is desirable to form or more $N/50$ number which becomes $N/5$ or less.

[0430] PD liquid crystal 226b is pinched between counterelectrode 225b and the scan electrode 393. The thickness of PD liquid crystal 226b sets to 5 micrometers or more 20 micrometers or less, and is set to 8 micrometers or more 16 micrometers or less still more preferably. Moreover, the mean particle diameter of the water drop-like liquid crystal of PD liquid crystal or the average aperture of a polymer network may be 0.7 micrometers or more 1.5 micrometers or less. Moreover, PD liquid crystal 226b may be the configuration which a macromolecule and liquid crystal form in the shape of a layer, and causes the reflection effect by dielectric interference by the existence of impression of an electrical potential difference, or is extinguished. Thickness in this case is set to 6 micrometers or more 18 micrometers or less.

[0431] The polarization shaft of polarizing plates 431a and 431b is considered as cross Nicol's prism arrangement. Therefore, when liquid crystal layer 226b is in a transparence condition, the light which carries out outgoing radiation from polarizing plate 431a decreases (disappearing), and when liquid crystal layer 226b is in a dispersion condition, the amount of the light by which outgoing radiation is carried out from polarizing plate 431a increases.

[0432] The electrical potential difference impressed to counterelectrode 225b and the scan electrode 393 is fundamentally good binary [of the electrical potential difference which changes liquid crystal layer 226b into a full dispersion condition, and the electrical potential difference changed into a full transparency condition]. However, the electrical potential difference impressed depending on the case is operated, and it is good also as a middle light-scattering condition.

[0433] It is desirable between display-panel 21a and display-panel 21b to carry out optical coupling in the optical coupling layer 126 from a viewpoint of prevention of halation and reduction of optical loss.

[0434] In addition, although a polarizing plate (a polarization film, polarization means) 431 is used by (drawing 39), even if it does not use, the quantity of light which carries out incidence to display-panel 21a can change. Moreover, it cannot be overemphasized that liquid crystal layer 226b may be TN liquid crystal and strong dielectric liquid crystal. Moreover, polarizing plate 431c may be arranged to the optical outgoing radiation side of display-panel 21a. In this case, the polarization shaft of polarizing plate 431c and the polarization shaft of polarizing plate 431a are arranged so that it may become cross Nicol's prism (rectangular cross) arrangement.

[0435] If constituted like (drawing 39), as shown in (drawing 8), the section 81 non-switching on the light or the lighting section 82 can be constituted by impressing an electrical potential difference to the scan electrode 393 one by one, and scanning the impression location. The width of face of this section 81 non-switching on the light or the lighting section 82 is freely controllable by the number of the scan electrode 393 which impresses an electrical potential difference. If the number of the scan electrode which impresses an electrical potential difference is made [many], width of face will become large. Therefore, by controlling the number of the scan electrode which impresses an electrical potential difference, the display image of display-panel 21a can be made bright, can be made dark, or can be controlled freely, and an animation display property can also be freely controlled now.

[0436] The configuration of (drawing 39) was what controls by display-panel 21b the light which carries out incidence to display-panel 21a from a back light 16. Therefore, display-panel 21b needed to be used.

[0437] This approach is shown in (drawing 42). Although the number of the scan electrode 393 which impresses ON state voltage is made into three in (drawing 42), it is possible not to limit to this and to control to arbitration. As shown in (drawing 42 (d)) from (drawing 42 (a)), the scan electrode 393 of the number of fixed number of line is made to turn on, and sequential migration of the location is carried out. Even if it constructs and ** the number of fixed number of line and moves a location gradually, sequential migration of the every one migration may be carried out.

[0438] (Drawing 40) has both liquid crystal layer 226b for incident light control, and liquid crystal layer 226a for light modulation in a display panel. 226b is PD liquid crystal layer. The counterelectrode 225 is formed on PD liquid crystal 226b. Thus, a counterelectrode 225 can be directly formed on a liquid crystal layer because PD liquid crystal

226b is a solid-state. Liquid crystal layer 226a for light modulation is pinched between this counterelectrode 225 and the array substrate 221.

[0439] Even if constituted in (drawing 40), a display condition [that it is the same as that of (drawing 39) (drawing 8)] is realizable. In addition, it cannot be overemphasized by arranging a polarizing plate 431 to both sides of a display panel 21 that display contrast can be improved. Moreover, it cannot be overemphasized that liquid crystal layer 226a may use any of other liquid crystal, such as guest host liquid crystal.

[0440] (Drawing 41) is block diagrams, such as a control section of the display of this invention which has the scan electrode 393. Two or more scan electrode 393 is formed in the scan substrate 392. The scan driver 411 is connected to each scan electrode 393. The scan driver 411, the source driver 102, and the gate driver 101 are arranged on the scan substrate 392, the array substrate 221, or the opposite substrate 222. Moreover, the output terminal of each driver is connected to tops, such as each substrate, with the COG (chip-on glass) technique. The bump (projection) was formed by Au and the terminal is pasted up by the electric conduction resin by which metal powder was added by phenol resin.

[0441] The scan driver 411 impresses a signal to the scan electrode 393, taking the source driver 102 and a gate driver 101, and a synchronization. Usually, this signal is binary [of the electrical potential difference (ON state voltage) which changes a liquid crystal layer into a light transmission condition and the electrical potential difference (OFF state voltage) changed into a light impermeability condition]. However, depending on the case, it can drive also to multi-tone. A drive impresses ON state voltage to 1 or two or more scan electrodes 393, is changed into a light transmission condition, and carries out sequential migration of this light transmission condition location. OFF state voltage is impressed to other scan electrodes 393.

[0442] Generally impression of ON state voltage constructs and ** two or more, impresses ON state voltage to the scan electrode 393 which impressed and adjoined coincidence, and performs the scan electrode 393 of an edge by the technique of impressing OFF state voltage from ON state voltage. However, you may carry out, impressing ON state voltage to two or more [of the adjoining scan electrode instead of what is limited to this technique].

Moreover, ON state voltage may be impressed to the discontinuous scan electrode instead of what is limited to sequential scanning, and an ON-state-voltage location may be changed at random synchronizing with a graphic display condition, and a scanning direction may be changed to **** called screen upper limit → lower limit and screen lower limit → upper limit by turns. moreover, the time amount which regularity does not limit a scan synchronization and moves from one scan electrode to the following scan electrode — not restricting — also carrying out — it does not limit to making it regularity. It is because it aims at these making it synchronize with the graphic display condition of a display panel 21, and changing into a good display condition.

[0443] By impressing ON state voltage to the stripe-like electrode (scan electrode) 393 formed in the longitudinal direction of a screen, the above example was what improves a display condition. In order to use the scan electrode 393, it was what is performed to a pixel line writing direction. (Drawing 43) makes an image quality improvement in the shape of a matrix.

[0444] (Drawing 43) is the explanatory view. The display screen (back light) is divided by the reflecting plate (nail ****) 15 in the shape of a matrix. Each field 107 divided in the shape of a matrix can perform transparency (outgoing radiation) of light, and disappearance (non-display) processing independently, respectively. In addition, a reflecting plate 15 is not necessarily required.

[0445] As shown in (drawing 44), the rectangular scan electrode 393 is formed in each viewing area 107 (arrangement). In addition, although the scan electrode 393 of this rectangle is the same as (drawing 39) explained as a function, in order to prevent mixing of explanation, in the case of (drawing 44), it is called the rectangle electrode 393. The selection terminal 441 is connected to the rectangle electrode 393, respectively, and the selection terminal 441 is connected with the output terminal of the scan driver 411 of (drawing 41). However, since the number of the selection terminal 441 increases when the rectangle electrode 393 is a matrix-like like (drawing 44), it is good between the scan driver 411 and the selection terminal 441 to make an encoder driver mediate.

[0446] Since the light which carries out incidence is controllable to the shape of a matrix, the better image display of the case of (drawing 44) becomes [the shape] possible from a back light 16 at a display panel 21. Moreover, ***** which is performing optical control stops being able to be conspicuous easily.

[0447] The configuration it is made to be in sight of an observer does not contribute (drawing 1), (drawing 39), etc. only to the improvement of an image for some screens (drawing 44). For example, image data is sent one by one by a packet method etc., and a cellular phone, an image space transmission system, etc. have it. [effective in a system/device] That is, it is because only the part to which the image has been sent is displayed and it becomes easy to control other parts, such as to make it a black display. Moreover, the method which makes the specific part of the display screen non-display from the relation of security (security protection) is also considered. It is because power consumption can be cut down if reduction of power consumption does not become about a display image when displaying black, or the back light of an applicable part is switched off.

[0448] In addition, although (drawing 44) considered as the rectangle electrode 393, this may be transposed to the light guide plate 14 arranged in the shape of a matrix (configuration). It is because the outgoing radiation light from a light guide plate is independently controllable if LED11 grade is arranged under each light guide plate 14.

[0449] (Drawing 44) was the method constituted in the shape of a matrix. Moreover, (drawing 40 (drawing 39 (drawing 1))) , it was the method constituted in the shape of a stripe as shown in (drawing 45 (a)). When shown in (drawing 45 (a)), or when it was shown in (drawing 44), the width of face of a light guide plate or the width of face of a stripe-like electrode was the same.

[0450] The configuration of (drawing 45 (b)) and (drawing 46) changes a part. (Drawing 45 (b)) makes stripe-like the scan electrode 393 or a light guide plate 14 thin (high density) in the center section. That is, in (drawing 45 (b)), the part of A is rude, and the part of B is formed thinly. Thus, the observer as whom forming thinly in the center section regards a display panel 21 will be sensitive in the center section of the display panel, discernment capacity will be high, and discernment capacity will be low at a periphery. Control to a display image can fully be performed by making it thin in the center section, as shown in (drawing 45 (b)). In a rectangular light guide plate 14 or the rectangular rectangle electrode 393, (drawing 46) is in the center section of the viewing area 107, and makes the area small (finely).

[0451] In addition (drawing 46 (drawing 45 (b))), although it set and the size of the scan electrode 393 and a light guide plate 14 was illustrated like two kinds It cannot be overemphasized that not the thing to limit to this but three or more kinds are sufficient, and the configuration (for example, arrangement from which the scan electrode width of face H changes with $4/4H \rightarrow 3/4H \rightarrow 2/4H \rightarrow 1/4H \rightarrow 2/4H \rightarrow 3/4H \rightarrow 4/4H \rightarrow 3/4H$) of having changed one by one is sufficient as magnitude etc.

[0452] In addition, although magnitude of the rectangle electrode 393 etc. was carried out to making it change by a center section, a periphery, etc. of a screen in the above example, it is meaningful in an image display device to change pixel size by the center section and periphery of a screen. Pixel size of the center section of the screen is made small, and suppose that it is highly minute.

[0453] (Drawing 1) etc. -- although explained as binary (an outgoing radiation condition, non-outgoing radiation condition), even if the light by which sets and outgoing radiation is carried out from each light guide plate 14 and display-panel 21b is binary, it can give distribution to the light which carries out incidence to a display panel 21 (drawing 39). This approach is explained using (drawing 47). It sets to (drawing 47) and is the 2nd frame next to the 1st frame (drawing 47 (c) is made into the 3rd frame next to the 2nd frame, and (drawing 47 (d)) is made into the 4th frame next to the 3rd frame.) about the 1st frame and (drawing 47 (b)) in (drawing 47 (a)). In addition, in order to give explanation easy, a light guide plate 14 or an electrode 393 is considered as 1/quadrisection.

[0454] In the 1st frame, the light emitting device 11 arranged at the light guide plate 14 or an electrode 393 is operated, and the outgoing radiation of a part 82 to one fourth of the lower light is made to be carried out from a light guide plate 16. With the 2nd frame, the outgoing radiation of a part 82 to two fourths of the light of one half to the bottom is made to be carried out. With the 3rd frame, the outgoing radiation of the light is made to be carried out from three fourths of the parts 82. It is made for all parts to serve as the optical outgoing radiation field (viewing area) 82 in the 4th frame.

[0455] Thus, if it is made to operate, the synthetic condition in four frames will become (drawing 47 (e)). That is, 107d of viewing areas is the brightest, and they can make viewing-area 107a the darkest.

[0456] It means that the above thing can change the quantity of light which carries out outgoing radiation from a back light 16 in each part of the display screen. In (drawing 47), the quantity of light by which outgoing radiation is carried out from a back light 16 was binary [of an outgoing radiation condition and a non-outgoing radiation condition], and was what performs a gradation display in several frames. Of course, if brightness adjustment can do each light guide plate etc. independently, in each part of a viewing area, brightness distribution can be formed by one frame. Two or more whites LED are attached in each piece of a light guide plate, and the approach of making the lighting number of this LED fluctuating, the method of making the current to white fluctuate, the approach of fluctuating the injection power to fluorescence tubing, and the approach of fluctuating the applied voltage to the scan electrode 393 are illustrated as the approach of carrying out brightness adjustment independently with each light guide plate.

[0457] In this invention, the amount of flux of lights by which can fluctuate the amount of flux of lights by which outgoing radiation is carried out from a back light 16 over a number claim, or outgoing radiation is carried out from a back light 16 by one frame can be fluctuated (field modulated light method).

[0458] A feeling of ***** appears [the direction which attached light and darkness to the display image at the display panel 21] in a display image. It is desirable to make a screen dark as much as possible in the case of a night sky. In this case, the amount of flux of lights by which outgoing radiation is carried out to homogeneity is reduced to all the fields of this invention back light 16. There is the approach of lessening decreasing the number of scan electrodes which impresses ON state voltage as the approach of a fall, and injection power to the light emitting device 11 of a light guide plate 14 etc. It is desirable to make a screen bright as much as possible in a case of under [the sun of the seashore]. In this case, it is easily realizable making high the electrical potential difference impressed to the scan electrode 393, making [many] the number of scan electrodes which impresses ON state voltage, or by reducing the injection electric energy to the light emitting device 11,114 attached in the light guide plate.

[0459] On the other hand, a bright part and a dark part may be intermingled in a display image. It is bright in the piece of a light guide plate of a display image subordinate bright in this case, or an electrical potential difference is impressed to the rectangle electrode 393, and the incidence of much light is made to be carried out with a display panel 21. The dark image subordinate of a display lessens light which makes low the electrical potential difference which there are or impresses the amount of optical outgoing radiation from the piece of a light guide plate to the rectangle electrode 393, and carries out incidence to a display panel 21. [few]

[0460] For example, (drawing 45 (b)), if it is the brightness other parts of whose it sets, the image of the part of a is dark, the parts of b, c, and d are bright, and are middle extent the applied voltage to scan electrode 393a -- high -- carrying out -- (-- the case where the polarization shaft of polarizing plates 413a and 413b is a cross Nicol's prism

-- the time of NW mode --) -- scan electrodes [393g, 393j, and 393l.] applied voltage -- low -- carrying out -- the applied voltage to other scan electrodes -- middle level -- then, it is good. In addition, what is necessary is to make low impression power to the light emitting device attached in light guide plate 14a, to make high applied voltage to the light emitting device attached in light guide plates 14g, 14j, and 14l., and just to let applied voltage to the light emitting device attached in other light guide plates be middle level, when (drawing 45) is a light guide plate method.

[0461] What is necessary is for the same to be said of the case of (drawing 46), for the image of the part of a to be dark, and for the parts of b, c, and d to be bright, and to make high applied voltage to rectangle electrode 393a, to make low rectangle electrodes [393b, 393c, and 393d] applied voltage, and just to let applied voltage to other rectangle electrodes be middle level, if it is the brightness other parts of whose are middle extent. in addition -- etc. (drawing 46 (drawing 45)) etc., although [the brightness of the scan electrode (rectangle electrode) 393 or a light emitting device 11,141] it set and brightness etc. is adjusted corresponding to the field according to each individual Not the thing to limit to this but the screen 107 whole is responded to the contents (pop [a classic, a personal computer still picture, a movie,] etc) or data (the change condition of a gamma property, light-and-darkness data, and light-and-darkness data, distribution condition etc of light-and-darkness data) of a video signal. You may control by adjusting brightness, contrast, etc.

[0462] Moreover, the size of the rectangle electrode 393 may not be limited to two etc. kinds etc., and various sizes are sufficient as it. For example, the magnitude of size may be three or more kinds, and the thing of size with the smaller child screen of a picture Inn picture crowds, and may be arranged. Moreover, the configuration of a light guide plate 14 and electrode 393 grade may not be limited a square or in the shape of a stripe, and the polygon, circular, the other stellate one, etc. of a hexagon and a triangle is sufficient as it. Moreover, the light guide plate 14 and the electrode 393 crowded, and did not need to be put in order, and it may arrange dispersedly, or could be arranged or formed in a part of viewing area 107. Moreover, the light in which each part of light guide plate 14 grade carries out outgoing radiation does not need to make the data or the contents of the video signal not necessarily reflect. In addition, a user may enable it to set it as arbitration according to the data or the contents of the video signal using remote control etc.

[0463] It is the explanatory view of the display of a method using the panel or back light of the configuration (drawing 46 (drawing 45)) of (drawing 48) etc. In addition, although 411 is considering as the scan driver in (drawing 48), it does not limit to this and is good also as a control section of a light emitting device 11 (141). That is, it is because the purpose may be attained if the scan driver 411 controls the light which carries out incidence to a display panel 21. Moreover, it cannot be overemphasized that the scan electrode 393 may be replaced with a light guide plate 14. In addition, in order to give explanation easy, suppose that they are the scan electrode 393 and the scan driver 411 in (drawing 48).

[0464] The display of this invention possesses two frame memories 485a and 485b. When switch section 484a stores data in memory 485a, switch section 484b has read data from memory 485b. Conversely, when it switches and section 484a stores data in memory 485b, switch section 484b has read data from memory 485a. As for memory 485a and memory 485b, read-out and writing are performed by turns as mentioned above.

[0465] the inside of the "average luminance" from the image data inputted as operation part 483 was shown in (drawing 76), the "maximum brightness", the "minimum brightness", "luminance distribution", the "light region number", and the "dark field number" -- all -- or the extract data of arbitration are created and this extract data is stored in the data storage section 482. The scan driver 411 is controlled from extract data.

[0466] As for the scan driver 411, stripe-like a scan electrode or the rectangle electrode 393 is connected. In the scan driver 411, it is an electrode 393 (in the case of light guide plate 14 method, the light emitting device 14 (141) connected to the light guide plate 14 is controlled.). Operation part 483 creates the data which were adapted for this scan driver 411.

[0467] On the other hand, the image data from switch section 484b are sent to the video-signal control section 481. To a video signal, the video-signal control section 481 performs a standup electrical potential difference and amplitude magnification control, and performs 1H or 1D reversal process, and it performs data manipulation so that it may be adapted for electric-light transfer characteristic of the liquid crystal layer 226 good. The data which ended such data manipulation are impressed to the source driver 102.

[0468] After processing of a level shift etc. is performed, D/A conversion of the source driver 102 is carried out, and it is impressed to a source signal line. in addition -- a drive method -- from (drawing 34) (drawing 29) -- etc. -- since it explained, it omits. however, a drive method -- from (drawing 34) (drawing 29) -- etc. -- it does not limit to a method. It cannot be overemphasized that any of 1D reversal drive which reverses the polarity of 1H reversal drive which reverses the polarity of the video signal impressed to the pixel electrode 230 for every 1-pixel line, 1V reversal drive which reverses the polarity of the video signal impressed to the pixel electrode 230 for every 1-pixel train, a 1-pixel line, and the video signal impressed to the pixel electrode 230 for every 1-pixel train are sufficient.

[0469] In (drawing 48), the quantity of light outputted from a back light 16 according to the image of a video signal is clearly controlled by the indicating equipment of this invention. The quantity of light furthermore outputted from a back light 16 adjusts a detail/contrast for every field where the shape of a stripe and a rectangle was subdivided. Of course, it cannot be overemphasized that you may control the quantity of light outputted from a back light 16 as one thing over all back light fields.

[0470] It cannot be overemphasized that the video signal impressed to the liquid crystal display panel 21 with a

natural thing may also perform black stretching and white elongation, and a gamma curve may be changed according to the contents of the video signal.

[0471] Moreover, it cannot be overemphasized that a display image may detect a still picture or an animation and control of a scan driver may control automatically.

[0472] Moreover, it is not necessary to control over all frames, and you may control based on the image data extracted to arbitration. Moreover, you may control, reflecting the past image data over a double frame.

[0473] Based on image data, the light by which outgoing radiation is carried out to the shape of a matrix from a back light in a back light is controlled by the indicating equipment of this invention as mentioned above. Therefore, since brightness adjustment etc. can be performed for each part of every even if a dark field and a light region are intermingled by one image, graphic display with MERIHARI is realizable.

[0474] (Drawing 49) is the period of two or more frames, and is the approach of operating a light guide plate 14 or the scan electrode 393, and forming light and darkness in a display image 107 in the shape of a matrix. (Drawing 49) is a matrix-like although it was a stripe-like in (drawing 47).

[0475] (Drawing 49) shows that it is dark in the part illustrating many laps, such as a slash (vertical line).

Therefore, display 107a is most darkly set to 107b->107c next, and 107d is the brightest. That is, it will be easy to understand if viewing-area 107a considers a three-frame period and 107b that a dark indication of a two-frame period and the 107c was given during the one-frame period among the periods of several frames. Of course, when strength of the number of the light emitting device 11 attached in the light guide plate 14 or the electrical potential difference impressed to liquid crystal layer 226b on a rectangle electrode is carried out and halftone permeability can be realized by one frame, it cannot be overemphasized that delicate transmittance control is realizable.

moreover -- **** (drawing 47 (drawing 49)) -- although light and darkness etc. are expressed by several frames, it cannot be overemphasized that it is realizable also when it does not limit to this, an one-frame period is divided at two or more periods and flashing etc. carries out light emitting device 11 grade within the divided period.

[0476] (Drawing 39) etc. -- although it expressed so that it might set and the scan electrode 393 might be sequentially scanned downward from on Screen 107, it may not limit to this and you may constitute like (drawing 50). In addition, in (drawing 50), although 393 is considering as the scan electrode, it may not be limited to this and may be transposed to a light guide plate 14. It is because this is the same as that of (drawing 48) and the purpose is also the same. That is, although scan (rectangle) electrode 393 method is illustrated and explained in order to give explanation easy also in future examples, it may not limit to this and you may be a light guide plate method.

[0477] In (drawing 50), two scan drivers 411a and 411b are provided, it connects with scan electrode 393a arranged the eventh, and scan driver 411a is connected to scan electrode 393b arranged the oddth at scan driver 411b. That is, the scan electrode 393 is connected with a different scan electrode 393 by turns one by one from the top.

[0478] As for the back light of (drawing 50), it is desirable to use combining the display panel 21 of an interlace display of NTSC etc. As shown in (drawing 51 (a)), in an odd frame, it scans sequentially from the oddth (393a) of the scan electrode 393, and changes into an optical outgoing radiation condition (or when taking the responsibility of liquid crystal etc. into consideration, it considers as the reverse). In even frames, like (drawing 51 (b)), it scans sequentially from the eventh (393b) of the scan electrode 393, and changes into an optical outgoing radiation condition (or when taking the responsibility of liquid crystal etc. into consideration, it considers as the reverse). Being above (drawing 51 (a)) and by combining (drawing 51 (b)), a full screen is chosen like (drawing 51 (c)), and the one display screen is displayed.

[0479] In addition, ***** [the number of them / it may not limit at a time to one the scan electrode 393 with which ON state voltage is impressed, and / two or more] in (drawing 51). Moreover, scan sequence may not be limited downward from on a screen, either, and may scan downward from on [from under / from a top / bottom ->] top ->. Moreover, depending on the case, a random scan is sufficient. It cannot be overemphasized that the above thing is applicable also about the configuration of (drawing 49). Moreover, although the display image of a display panel 21 is a still picture, it may detect whether it is an animation, and a control system may be switched. Since this is the same as that of explanation of (drawing 10), it omits explanation.

[0480] It was what improves an animation display property by displaying a band-like black display on a display panel 21, or making [it is not / a display image / visible and] it into an observer during a fixed period, by the above configuration. In order to realize this, the scan (rectangle) electrode 393 was used and the light guide plate 14 was controlled. However, when it is not based on this approach but ** also controls the video signal to a display panel 21, the mutual change display of image display and a black display is realizable. that is, it is free to combine with a method [having made the back light always turn on freely (of course - (drawing 39) (drawing 51))] -- by making a display image indicate by black, a black display is seemingly inserted between images and animation display is improved.

[0481] In addition, in explanation of this specification, although explained having operated the subdivided light guide plate 114 or scan electrode, and having performed the black display, this is for giving explanation easy. It cannot be overemphasized that a self-luminescence device, for example, an EL element, a firefly luminescence component, etc. may be arranged in the shape of a matrix and in the shape of a stripe, these may be controlled as other approaches, and a black display may be performed.

[0482] However, if it is going to perform a black display between image display, **** conversion etc. needs to perform the display rate of a video signal at a high speed. If the display rate of a video signal is opened, the frequency of a digital disposal circuit will become high and circuit cost will become high. Since this technical problem

is received, in the display panel of this invention shown in (drawing 52), the viewing area 107 of a display panel 21 was divided into four fields (107a, 107b, 107c, 107d), and the source driver (102a, 102b, 102c, 102d) which drives each field is formed or arranged.

[0483] In (drawing 52), viewing-area 107a is driven by source driver 102a. Moreover, it connects with source signal-line 228 of source driver 102a a, and TFT241 of viewing-area 107a a is connected to gate driver 101a. Viewing-area 107b is driven by source driver 102b. Moreover, TFT241b of TFT of viewing-area 107b and 241b is connected to source signal-line 228 of source driver 102b b. Moreover, it connects with gate driver 101b. Similarly, TFT241 of viewing-area 107c c is connected to source signal-line 228c and gate driver 101c of source driver 102c, and TFT241d of 107d of viewing areas is connected to source driver 102d case signal-line 228c and gate driver 101d.

[0484] Thus, by constituting, viewing areas 107a-107b can be driven according to an individual. That is, it is not necessary to perform time-axis elongation. For example, the source drivers 102a and 101a are used for one fourth of the time amount of the beginning of one frame, an image is displayed on viewing-area 107a, source driver 102b and gate driver 101b are used for the one following fourth of time amount, an image is displayed on viewing-area 107c, source driver 102d and gate driver 101d are used for one fourth of the time amount of the last, and an image is displayed on 107d of viewing areas.

[0485] The part which does not show the image displays the black display 81. Thus, if it displays, without performing time-axis expanding, an image can be displayed on the time amount of 1/4 of one frame, and a black display can be realized to other three fourths of time amount, and a graphic display location can be moved one by one.

[0486] In addition, in (drawing 52), although a viewing area 107 considers as quadrisection, it may not be limited to this, and two division, trichotomy, or more than quadrisection is sufficient as it. For example, in 2 division, one side is made as a black display, it makes another side graphic display, and a display condition should just be switched by turns.

[0487] Although one field was made into graphic display among four and other fields were considered as the black display (display which is not an image) in (drawing 52), it does not limit to this, two or three fields are made into graphic display, and it is good also considering other fields as a black display. Moreover, as shown in (drawing 53), a graphic display field and a black viewing area may be displayed by turns, and sequential migration of the graphic display field may be carried out.

[0488] (Drawing 53 (a)) is taken as the black displays 81a and 81b and graphic display 82a and 82b. This display time is 1 / 2 frame time. (Drawing 53 (b)) is in the next condition of (drawing 53 (a)), could shift the location of the black displays 81a and 81b, and has shifted the location of graphic display 82a and 82b. This (drawing 53 (a), (b)) image of one frame is displayed.

[0489] (Drawing 53 (c)) shows the condition of the following frame. Moreover (drawing 53 (d)), the next condition of (drawing 53 (c)) is shown. That is, the image of the 1st frame is displayed by (drawing 53 (a) and (b)), and the image of the 2nd frame is displayed by (drawing 53 (c) and (d)). Moreover, an image opens and displays spacing while displaying it on one half of the whole screens (for example, it carries out (drawing 35 (c2), 107a, 107c)).

[0490] In addition, in (drawing 53), an applicable back light may consider the part of 81 to be an astigmatism LGT condition, and it may be considered to be the condition of the scan electrode 393 of not choosing. Therefore, (drawing 53 (a2) (d2) In), Screen 107 may be in all display conditions (there is no black display condition). Moreover, one by one although [(drawing 53) / a viewing area (for example, 107a)] scanned downward, it is good, though it does not limit to this and the display switch of each viewing areas 107a and 107c and viewing areas [107b and 107d] parts is carried out all at once.

[0491] The field which shows the image came by the above example as a fixed area. However, you may change not in accordance with the thing to limit to this but in accordance with the display condition of an image. (Drawing 10) etc. — although a screen becomes dark so that there are many black displays 81, as explained, animation dotage decreases. Conversely, although a screen becomes bright so that there are few black displays 81, it becomes easy to generate animation dotage.

[0492] As for the brightness of this animation dotage and a screen, it is desirable to apply to the contents of image data or the circumference illuminance of a display panel 21, and to make it change automatically, or for a user to use remote control etc., and to set up and to enable it to adjust freely. for example, — (— drawing 54 (a)) — the graphic display field (following field) 82 — most — narrow — (— drawing 54 (b)) — next — (— the condition of drawing 54 (c)) makes it large most. In addition, (drawing 54 (d)) is in an all-points LGT condition. When the user etc. enables it to set up freely the between from all astigmatism LGT conditions to an all-points LGT condition, an image quality improvement can be made good. In addition, also in (drawing 54), in the lighting field 82, it can be considered the graphic display field of a display panel 21, and can also be considered the back light 16 turned-on section.

[0493] Although the lighting field 82 was band-like [one], as shown in (drawing 55), two or more band-like 82a and 82b are sufficient as (drawing 54), and it may be divided or more into three. Moreover, it may be divided in the shape of a matrix like (drawing 46), and may be displayed. Therefore, the lighting field 82 may not be limited to band-like, and a dot-like is sufficient as it.

[0494] In addition, it is good, though viewing-area 107a shows the image of the 2nd frame and, as for viewing-area 107b, viewing-area 107c shows the image of the 3rd frame for the image of the 1st frame in (drawing 55). Therefore, if lighting section 82b makes the 1st current frame the display condition, you may think that lighting section 82a makes the 2nd next frame of the 1st frame the display condition.

[0495] Flashing of a back light 16 may blink the whole back light, as divide back light 16 grade into two or more fields, and each is controlled and also it is shown in (drawing 56). For (drawing 56 (b) and (d)), a putting-out-lights condition, and (drawing 56 (a) and (c)) are in a lighting condition.

[0496] It is desirable to satisfy t_1 for the time amount of a lighting condition, and to satisfy the relation between t_2 , then $0.25 \leq t_1/t_2 \leq 1.5$ for a putting-out-lights condition now. Furthermore, it is desirable to satisfy the relation of $0.4 \leq t_1/t_2 \leq 1.0$.

[0497] (Drawing 56) lights up and switches off a full screen 107 collectively. A back light 16 is blinked, and also even if the thing which a full screen 107 is turned [thing] on and makes the light put out controls the scan electrode 393, it can be performed. In addition, it can carry out also by impressing an electrical potential difference to the counterelectrode 255 of the liquid crystal display panel 21.

[0498] As for the liquid crystal display panel 21, the counterelectrode 225 is formed over all the fields of the liquid crystal layer 226. When the liquid crystal display panel 21 is in NW (normally white) mode, it will become a black display if a big electrical potential difference (saturation voltage) is impressed to a counterelectrode 225. In NB (normally black) mode, it is this reverse. On these specifications, if a liquid crystal layer is made into NW mode for giving explanation easy, and the electrical potential difference more than a predetermined electrical potential difference is impressed to liquid crystal 226, an image shall not be displayed.

[0499] In addition, although the black display was generally meant when an image was not displayed, it was said above that it is not what makes it hard to be this is not visible to an observer in a display image, or visible, and means only a black display completely. That is, even if some displays are in sight, it will be a black display, and if an image is hard to look by white display, this will also be a black display notionally. Therefore, a gray display etc. is included in the concept of a black display with a natural thing. Usually, what is necessary is just to consider the condition of having reduced screen intensity rather than the display condition. As for a brightness fall, it is more desirable than usual to carry out to 1/2 or less.

[0500] (Drawing 57) possesses a pulse generating circuit 571. A pulse generating circuit outputs a sine wave, a square wave, etc. Moreover, it is constituted so that it can carry out adjustable [of the signal amplitude to output] in ± 7 (V). That is, a pulse generating circuit impresses a signal to a counterelectrode 225, carries out orientation of the liquid crystal molecule, and is made into a black display condition.

[0501] The output of a pulse generating circuit 571 is connected to the terminal a of the switch circuit 484. Let the terminal b of the switch circuit 484 be fixed potential. Manual switches, such as an insulating mold relay / switch or a push switch according [the switch circuit 484] to an analog switch, a mechanical relay, a CMOS relay, and a photocoupler, and a snap switch, etc. correspond. moreover, switching of the terminal a of the switch circuit 484, and Terminal b — remote control actuation of a user — moreover, the illuminance of outdoor daylight — or a switch is automatically performed manually by the data of the video signal to a display panel 21.

[0502] As for b terminal of the switch circuit 484, the electrical potential difference sometimes (at the time of graphic display) impressed to a counterelectrode 225 is usually impressed. Usually, applied voltage is a common electrical potential difference. However, the signal reversed in every field (frame) is impressed at the time of an opposite reversal drive. Moreover, since the electrical potential difference impressed to Terminal b reduces a flicker, it is desirable to constitute so that an electrical potential difference can be adjusted in ± 0.8 (V).

[0503] moreover, an electrical-potential-difference pulse (a sine wave is sufficient) comparatively high at the time of display initiation when the liquid crystal display panel 21 is in OCB mode — a 0.1 – 1-second about room — it is necessary to carry out period impression Since it corresponds to this, it is desirable to constitute the amplitude value of a pulse so that it can change automatically.

[0504] The terminal C of the switch circuit 484 is connected with the counterelectrode 225 of the liquid crystal display panel 21. Therefore, it switches and connects with Terminal b or Terminal a from the terminal c of a circuit 484. Therefore, when outputting the input from Terminal a to Terminal c for making the display screen 107 a black display, and displaying an image, the input from Terminal b is outputted to Terminal c. Animation dotage is improvable by impressing the electrical potential difference of Terminal a and Terminal b to a counterelectrode 225 by turns. Moreover, when a display image is a still picture, it is [then] good, impressing the electrical potential difference of Terminal b to Terminal C. These control is performed in a control circuit 103. Since the control circuit 103 grade is explained above, it omits explanation.

[0505] (Drawing 58) is an explanatory view for explaining actuation of the drive circuit shown in (drawing 57). (Drawing 58 (a)) is in the condition that V_c (common electrical potential difference) was impressed to the counterelectrode 225. Here, in order to give explanation easy, V_c explains as 0 (V) and (GND). (Drawing 58 (a)) is in the condition that the image is displayed on the display panel 21. A different polar electrical potential difference (+ V_1 , - V_2 , + V_3 , - V_4 ) for every 1-pixel train is impressed to the pixel electrode 230, and natural drawing is displayed.

[0506] (Drawing 58 (b)) shows the place where + V_r electrical potential difference is impressed to the counterelectrode 225 from the pulse generating circuit 571, and (drawing 58 (c)) shows the place where - V_r electrical potential difference is impressed to the counterelectrode 225 from the pulse generating circuit 571. V_r electrical potential difference is 80% – 150% of amplitude value of maximum about the amplitude of the signal used in case an image is usually displayed (absolute value). + Make into 1 horizontal-scanning period, coincidence, or its integral multiple average $t = (t_1 + t_2)$ of the time amount t_1 which is impressing V_r electrical potential difference, and the time amount t_2 which is impressing - V_r electrical potential difference. However, it is desirable to consider as 1 horizontal-scanning period most preferably, and being referred to as $t_1 = t_2$ is desirable.

[0507] If the electrical potential difference of V_r is impressed to a counterelectrode 225 like (drawing 58 (b) and (c)), a high electrical potential difference will be impressed relatively [liquid crystal / 225], and a liquid crystal molecule carries out orientation actuation, and serves as a black display. Therefore, image display and a black display can be carried out by turns.

[0508] It cannot be overemphasized that they are utilizable not only for the improvement of animation dotage but a pixel brilliance control even if these methods of presentation carry out contrast adjustment. moreover — etc.

(drawing 58) etc. — **** — the case where a counterelectrode 225 is divided and it is formed corresponding to the pixel 230 of R, G, and B, for example although the counterelectrode 225 considered as the solid electrode — each counterelectrode (225R, 225G, 225B) — it cannot be overemphasized that V_r electrical potential difference may be impressed and a black display may be realized especially independently.

[0509] In addition, it cannot be overemphasized that the drive approach / method of presentation of this invention are applicable also to the display panel of a field sequential display.

[0510] In order to explain the drive approach of (drawing 59) (drawing 58 (drawing 57)) in more detail, it illustrates by the representative circuit schematic. The output from a pulse generating circuit 571 is impressed to the counterelectrode 225 of a display panel 21. Therefore, alternating voltage is impressed to the liquid crystal layer 226 which is a capacitor, and it becomes a black display. In addition, when the liquid crystal layer 22 is in NB (normally black) mode, it is necessary to make amplitude value of driver voltage into this reverse.

[0511] The above example is the reference (drawing 60) which was what impresses an electrical potential difference etc. to a counterelectrode 225, and realizes the mutual change display of image display and a black display. (drawing 60) — setting (drawing 60 (a)) — the screen whole — an image display condition — (— drawing 60 (b)) starts black display 107b from the screen upper part, and moves this black display 107b to screen down one by one (drawing 60 (c), (d)). On the other hand, image 107a of the following frame is displayed from the upper part of a screen (drawing 60 (c)).

[0512] Such the method of presentation / a drive approach are realizable with the method which impresses an electrical potential difference to a counterelectrode 225 as shown in (drawing 58), or scan electrode 393 method as shown in (drawing 40). moreover, (drawing 40) also described — as (drawing 61) — it cannot be overemphasized that one a scan / rectangle electrode 393 may be arranged to two or more pixel line or two or more pixel trains so that it may be shown. Moreover, ***** [the number of the scan drivers 411 / one] as it is not necessary to prepare more than one as shown in (drawing 50), and shown in (drawing 62). Moreover, in (drawing 57), it switched and it was presupposed that V_c electrical potential difference or V_r electrical potential difference is impressed to a counterelectrode 225 by the circuit 484. However, what is necessary is to prepare the impression terminal of V_c and V_r electrical potential difference in the scan driver 411, and just to constitute so that one of two or more of these electrical potential differences can be chosen and impressed when a counterelectrode 225 is the scan electrode (rectangle electrical potential difference) 393 like (drawing 62). For example, when performing a black display, $+V_r$ or $-V_r$ electrical potential difference is inputted, and it inputs into the scan electrode 393 (= counterelectrode), and, in the case of image display, V_c electrical potential difference is impressed to the scan electrode 393 (= counterelectrode). Thus, black display and image display can be performed by turns by driving.

[0513] In addition, it may bundle up to all the scan electrodes 393, it is not necessary to impress $+V_r$ electrical potential difference or $-V_r$ electrical potential difference, and $+V_r$ electrical potential difference and $-V_r$ electrical potential difference may be impressed by turns in (drawing 62). For example, it is the approach of impressing $+V_r$ electrical potential difference to 393a and 393c—, and impressing $-V_r$ electrical potential difference to 393b—. Every frame (field) is made to reverse the polarity impressed to each scan electrode 393 (reference). (drawing 63) Thus, a large absolute value with the electrical potential difference impressed to the pixel electrode 230 can be taken by impressing the electrical potential difference reversed to the scan electrode 393. Moreover, a flicker cannot be conspicuous easily and image quality also improves. (Drawing 57) It sets and it cannot be overemphasized like (drawing 10) that the scan driver 411, a gate driver 101, and the source driver 102 take a synchronization, and display an image on a display panel 21 (drawing 63).

[0514] As for the scan driver 411 or a pulse generating circuit 571, it is desirable to arrange on the array substrate 221 by the electrode terminal 644 which consists of a projection electrode with a COG technique as shown in (drawing 64), and conductive paste 642a. The output signal (output voltage) from scan driver 411 grade is transmitted with the circuit pattern 643 formed on the array substrate 221. The counterelectrode 225 or the scan electrode 393, and the circuit pattern 643 are electrically connected by conductive paste 642b. In addition, conductive paste 642b is formed in the outside of closure resin 641.

[0515] By loading scan driver 411 grade on the array substrate 221 as mentioned above, manufacture of a display panel 21 becomes easy by loading scan driver 411 grade into the source driver 102, a gate driver 101, and coincidence.

[0516] (Drawing 65) shows the wiring condition of the scan electrode 393 and a pixel line. However, it cannot be overemphasized that the scan electrode 393 may arrange one scan electrode 393 to two or more pixel lines, and two or more scan electrodes 393 may be conversely arranged in a 1-pixel line.

[0517] In addition, although the scan electrode 393 has explained forming or arranging to the opposite substrate 222 side as a premise, it may not be limited to this and may form the scan electrode 393 in the array substrate 221 side. For example, in (drawing 65), the configuration which formed the insulator layer on the scan electrode 393, and formed the pixel electrode 230 on it is illustrated. In an equal circuit, it becomes like (drawing 66). in addition, the thing to limit to the stripe-like scan electrode 393 — not but — etc. (drawing 46) etc. — a rectangle-like

electrode as shown is sufficient.

[0518] The electrical potential difference (signal) outputted from scan driver 411a is transmitted to the scan electrode 393, and this electrical potential difference (signal) is transmitted to the pixel electrode 230 through a dielectric film 246 (P points). Therefore, also in the configuration of (drawing 66), since the potential of P points can be operated, the voltage which can be impressed to the liquid crystal layer 226 can be controlled, and a black display etc. can be performed.

[0519] The above example was what performs a black display by impressing an electrical potential difference or a signal to the scan electrode 393 or counterelectrode 225 grade. In case a black display is performed, it is not based on the signal impressed to the source signal line 228, but a black display is performed. However, actuation is also easy if a black display is performed by transmitting a black indicative data (signal) to the source signal line 228, and writing this black indicative data (signal) in the pixel electrode 230. The source driver 682 and the control driver 684 take a synchronization, and (drawing 68) makes a black display electrical potential difference hold to the pixel electrode 230.

[0520] The control driver 684 outputs VL electrical potential difference for VH electrical potential difference. VH electrical potential difference is ON state voltage which makes TFT241 turn on. VL electrical potential difference is OFF state voltage which makes TFT241 turn off. The control driver 684 possesses the control signal line 685, and VH or VL electrical potential difference is impressed to this control signal line 685. Although one control signal line 685 is illustrated in (drawing 68) as the 3-pixel line is shared, it may not limit to this, and one control signal line may be used at a 1-pixel line, and one control signal line may be used at a multi-pixel line. the connection condition with TFT241 of the pixel 230 of (drawing 68), the source signal line 228, or the gate signal line 261 is more detailed (drawing 67) -- it is shown like.

[0521] If ON state voltage is impressed to the gate signal line 261, TFT241b turns on, and the electrical potential difference currently then impressed to the source signal line 228 is impressed to the pixel electrode 230. Moreover, if ON state voltage is impressed to the control signal line 685, TFT241a turns on, and the electrical potential difference currently then impressed to the source signal line 228 is impressed to the pixel electrode 230. Therefore, the signal with which one pixel electrode 230 is impressed by a gate driver 101 and the control driver 684 is controlled. Therefore, to the pixel electrode 230, TFT241a and TFT241b are separately controllable.

[0522] In (drawing 68), the source driver 102 possesses a shift register 682 and OR circuit 681, an analog switch 683, etc. as main components. Supply voltage is the single power supply of 3 (V) or 3.3 (V), possesses a charge pump circuit inside and is making the required electrical potential difference.

[0523] A shift register 682 possesses a data (DATA) terminal and a clock (CLK) terminal, and shifts the data of a data terminal. And it is operated so that the analog switch 683 of a location with data may close. If a GONB terminal is made into H level, all the outputs of an OR circuit serve as H level, and all analog switches (ASW) are turned on. Therefore, the video signal impressed to the SIG terminal can be impressed to all the source signal lines 228 by operating a GONB terminal. This GONB terminal is used as an object for precharge. A SIG terminal is a terminal which impresses a video signal.

[0524] In (drawing 68), since analog switch 683b has closed, the video signal will be impressed to source signal-line 228b. The capacitor is seemingly formed in each source signal line 228. This capacitor is formed mainly of the intersection of the gate signal line 261 and the source signal line 228. It closes one analog switch 683 at a time one by one with the output of a shift register 682, and a video signal is impressed to each source signal line 228 in accordance with it (sample hold is carried out).

[0525] The analog switch 283 is formed with the low-temperature polish recon technique, the relation of the W/L ratio LP and W/L ratio LN of N channel of P channels is formed so that the relation of $0.8 \leq LP/LN \leq 2.5$ may be satisfied, and it is desirable to satisfy the relation of $1.2 \leq LP/LN \leq 2.0$ more preferably. In addition, as for the resistance of a source signal line, it is desirable to consider as 50 ohms or more 250 ohms or less.

[0526] ON state voltage is impressed to one gate signal line 261 at a 1 horizontal-scanning period (selection period of a 1-pixel line), in the next 1 horizontal-scanning period, ON state voltage is impressed to the following gate signal line 261, and OFF state voltage is impressed to the front gate signal line 261. If ON state voltage is impressed to a gate signal line, TFT241a connected to this gate signal line will turn on, and the electrical potential difference currently then impressed to the source signal line 228 (sample hold is carried out) will be written in the pixel electrode 230.

[0527] (Drawing 69) is the wave of the video signal inputted into a SIG terminal. In order to give explanation easy, (drawing 69) shows the case of the 1F reversal reversed once in the 1 field (frame). In addition, if it is in NW mode in the wave of (drawing 69), the image of six steps from which the bottom of a screen serves as [the upper part of a screen] a white horizontal stripe with a black horizontal stripe should be displayed.

[0528] By the drive approach of (drawing 69 (a)), black is written in the time amount of t1 in the display screen 107 of a display panel 21 (it becomes a black display). An image is displayed on the time amount of t2. With the configuration of (drawing 68), since it connects with TFT241b of a 3-pixel line, if the control signal line 685 has the same shift register clock of the shift register clock of the control driver 684, and a gate driver 101, each pixel line should switch it to the time amount of t1 with the black display by 3X. And the image should be displayed sequentially from the upper part of a screen after the black display.

[0529] What is necessary is just to perform relation between the black display period t1 and the image display period t2 in consideration of the rate of the control driver 684, and the rate of a gate driver 101 (can set as arbitration or it is a design matter). If the black display time t1 excels, animation dotage will improve. However, a display image

becomes dark.

[0530] In addition, as for the relation between t_1 and t_2 , in (drawing 69), it is desirable to make it satisfy the relation of $0.2 \leq t_1/t_2 \leq 2$. Moreover, it is desirable to constitute so that one [at least] period may be made automatic also with adjustable with a means among t_1 and t_2 .

[0531] (Drawing 69 (b)) divides the period of t_1 into the period of t_{1a} and t_{1b} . As for the period of t_{1a} , t_1 of (drawing 69 (a)) corresponds. That is, it is a black display period. The period of t_{1b} is a precharge period. An electrical potential difference is impressed to the source signal line 228 at the period of t_{1b} , and the write-in deficiency in performance of an analog switch 683 is canceled. As for the precharge electrical potential difference V_1 , it is desirable to carry out 70% or more to 120% or less of the mean amplitude value VA of the video signal (all area 107) impressed in the next field (frame). Or when precharging to every 1H, it is desirable to carry out 70% or more to 120% or less of the mean amplitude value VA of the video signal impressed to the following pixel line. Calculation of VA is easily computable by calculating the data of memory 485.

[0532] In addition, although referred to as $t_1+t_2=1F$ in (drawing 69), it does not limit to this. For example, it is good also as $t_1+t_2=1H$ (1 horizontal-scanning period). That is, what is necessary is to divide 1H period into t_1 and t_2 , to make t_1 into a black display (high voltage) image, and just to make t_2 into an image data (natural drawing) image. And the period of t_1 is made to turn on TFT241b, and the period of t_2 is made to turn on TFT241a. However, it is necessary to make it spacing with fixed pixel line to which TFT241b chosen by the control driver 684 was connected and pixel line to which TFT241a chosen as the gate driver 101 was connected. Otherwise, it is because image data will be immediately written in after a black display.

[0533] Moreover, although [(drawing 68)] one control signal line 685 controls three pixel lines, this may be an example, and a 1-pixel line is sufficient as it, and it may be a multi-pixel line more. Moreover, the pixel line to control may choose and control the pixel line which did not need to continue and was dispersed.

[0534] In addition, in (drawing 68), although [the driver / the control signal line 685] the control driver 684 operated the internal shift register and sequential selection is made, it may not limit to this, and random selection may be made, and all the control signal lines 685 may be chosen at once, and a black display may be realized.

[0535] (Drawing 70) is the configuration which added the GOE terminal 701 to the gate driver 101. If the GOE terminal 701 is made into H level, ON state voltage will be outputted to all the gate signal lines 261. Therefore, all TFT(s)241 will be in an ON state, and write the electrical potential difference impressed to the source signal line 228 in the pixel electrode 230.

[0536] the GOE terminal 701 -- (t_1 period of drawing 69 (a)) -- or (drawing 69 (b)) makes it H level at a t_{1a} period. Therefore, a full screen 107 serves as a black display at this period. In addition, although [the example of (drawing 70)] the full screen is collectively indicated by black, if two or more GOE terminals are formed and a screen is divided, a screen can be divided and it can indicate by black. moreover -- -- if it enables it to control the pixel line in which t_1 of drawing 69 (a)) carries out period ON, and the pixel line in which t_2 carries out period ON according to an individual -- a stroke -- even if it is [every / behavior], black display writing and image display writing can be switched. This configuration forms the shift register 1 for period selection of a gate driver 101t1, and the shift register 2 for period selection of t_2 , switches this output on real time, and should just choose the gate signal line 261. Moreover, it is shown in (drawing 69 (b)). Since it is clear, as for the ability to also perform application of precharge time amount t_{1b} , also in (drawing 69 (b)), explanation of (drawing 68) can be applied correspondingly. Therefore, explanation is omitted.

[0537] The above example was what outputs both the signal which performs a black display from the source driver 102, and the signal which performs image display. However, if the source driver 102 is made to pay all, it will be necessary to carry out **** conversion of a video signal or, and the cost of a display will become high for complicated video-signal processing being needed etc.

[0538] (Drawing 71) copes with this technical problem. 711 is a reset signal line. The signal is impressed in order to perform a black display to this signal line. They are a 5 to 50kHz square wave, or a sine wave as an example. (Drawing 68) etc. -- it is the same as that of the signal for a black display which the explained source signal line 102 outputs. ON of TFT241b writes the signal 711 currently impressed to the reset signal line 711 in the pixel electrode 230. Therefore, the liquid crystal layer 226 on the pixel electrode 230 carries out orientation, and an applicable pixel serves as a black display.

[0539] In addition, although the reset signal line 711 is connected to a pixel line writing direction, connect in the direction of a pixel train, and connect in the shape of a matrix, or connect with TFT241b of two or more pixel lines or a train, and also perform the black display for every block.

[0540] Moreover, although the specification of this invention illustrates and explains TFT as a switching element, you may be the method which may not limit to this, may switch according to an operation of the plasma of switching elements, such as a thin-film diode (TFD), a plasma address type liquid crystal display panel, etc., and the thing of a mechanical relay especially device of operation, a CMOS relay, a phot relay, etc. are sufficient as in a scan electrode method, in addition performs the actual-value response of STN etc. Moreover, TFT241 is not limited to the location of (drawing 71) that the drain terminal should just be connected to the pixel electrode 230.

[0541] If the reset signal line 711 is usually held to fixed potential (for example, counterelectrode 225 potential) (when not resetting), it can form addition capacity by using a reset signal line and the pixel electrode 230 as an electrode. In this case, it is necessary to constitute the reset signal line 711 so that it may have fixed electrode width of face under the pixel electrode 230. Moreover, the reset signal line 711 will not fall a numerical aperture, if it forms with transparent electrodes, such as ITO. What is necessary is just to form some transparent electrodes with

a metallic material, when it forms with a transparent electrode and wiring resistance becomes high too much. In addition, the problem of a numerical aperture does not turn into a technical problem, when the pixel electrode 230 is a reflector.

[0542] ON of TFT241a writes the video signal currently impressed to the source signal line 228 in the pixel electrode 230. Therefore, an image is displayed on a display panel 21. On the other hand, if TFT241b turns on, it is impressed by the reset signal line 711. The signal for a black display is written in the pixel electrode 230. Therefore, a part or all of a viewing area of a display panel 21 serves as a black display. the field by which it is indicated by black, and the field by which image display is carried out -- alternation -- or animation dotage etc. is easily improvable by considering as a scan condition. forming preferably the gate driver to which gate signal line 261a was connected, and the gate driver to which gate signal line 261b was connected -- a video signal etc. -- **** conversion -- it is not necessary to carry out -- complicated circuitry -- it is not necessary to carry out -- a black display and image display -- alternation -- or it can carry out to coincidence.

[0543] (Drawing 72) is a representative circuit schematic including the periphery of (drawing 71). The signal for a black display is outputted from a pulse generating circuit 571. Gate driver 101b chooses the pixel which performs a black display, and gate driver 101a chooses the pixel which performs a pixel display.

[0544] (Drawing 73) is the configuration of providing source driver 102b for a black display, gate driver 101b, and source driver 102a and gate driver 101b for image display. TFT241a is connected to gate signal line 261a which was connected to source signal-line 228a connected to source driver 102a, and was connected to gate driver 101a. TFT241b is connected to gate signal line 261b which was connected to source signal-line 228b connected to source driver 102b, and was connected to gate driver 101b. TFT(s) 241a and 241b are arranged in the diagonal location of the pixel electrode 230.

[0545] Thus, by forming a TFT array, TFT241a displays an image one by one per pixel line, and TFT241b also displays a black display one by one per pixel line.

[0546] With the configuration of (drawing 73), it is made to synchronize with the same clock and the group of source driver 102a and gate driver 101a and the group of source driver 102b and gate driver 101b are only operated. Therefore, circuitry also becomes easy. moreover, spacing of the pixel line number which is rewriting the pixel line number currently rewritten to the black display, and image display -- a user -- or a system -- or it becomes easy to carry out adjustable automatically. Moreover, increase of black viewing-area area and contraction are also easy. Therefore, contrast adjustment and screen intensity adjustment also become easy.

[0547] (Drawing 74) shows the configuration of (drawing 73) by the representative circuit schematic. In addition, in the configuration of (drawing 73), if the addition capacity 262 is constituted by using the gate signal line 261 and the pixel electrode 230 as an electrode, a pixel numerical aperture falls and is also desirable.

[0548] This invention is characterized by having or carrying out the functions (a gamma curve, monochrome expanding, etc.) which amend video-signal data, and the function which creates the signal which modulates the light of a back light from a video signal, and controls a back light according to the contents of the video signal. (Drawing 75) is the block diagram. However, the matter explained by (drawing 10) is omitted as much as possible.

[0549] From the video-signal processing circuit 106, the data with which gamma curve and monochrome elongation processing were performed for the driver controller 103, HD, and VD periodic signal are sent. The driver controller 103 controls a gate driver 101 and the source driver 102, and displays an image and a black display on a display panel 21. Moreover, these are also controlled when the scan driver 411 and the pulse generating circuit 571 are constituted or loaded on the display panel 21.

[0550] On the other hand, the flashing information on a back light, a flashing period, an intensity level, etc. are sent to the back light controller 105 from the video-signal processing circuit 106. The back light controller 105 is based on these signals, and is the LED driver 104 (the light emitting device driver should be considered.). for example, the concept containing EL driver, a fluorescence tubing driver, a fluorescence component driver, etc. -- it is -- it controls, and each part or the whole of a back light is modulated the light of or blinked.

[0551] Therefore, the improvement of a high contrast display and animation dotage etc. can be efficiently made by performing modulated light of a back light, etc. and amendment processing of a display image to coincidence. In addition, it is desirable to attach in the video-signal processing circuit 106 automatically the switch SW which can be operated manually. By operating SW, processing in case the images displayed on a display panel 21 are a still picture and an animation is switched.

[0552] This invention is mainly concerned with (drawing 76), and it is the block diagram of the video-signal processing circuit 106 section. The average luminance of a screen, the maximum brightness, and the minimum brightness are extracted from the image data of memory 485a. Weighting processing is carried out with a multiplier 761, and these brightness data are sent to data-processing circuit 762a. The multiplier of weighting processing is constituted so that a user can set up automatically with the contents of an image, or ambient illuminance arbitrarily. these contents of an image -- the thing according to a movie, a concert, and that genre -- or the thing of a bright sheet, a dark scene, or a screen intensity condition is meant.

[0553] It is necessary to make screen intensity high, and when making it change with ambient illuminance has the high ambient illuminance which observes a display panel 21, and ambient illuminance is low, it is because it is desirable to make screen intensity low also from a viewpoint of power saving. Ambient illuminance is easy if a phot sensor detects. Moreover, it is desirable to also detect and consider the color temperature of a surrounding light by the color sensor.

[0554] Moreover, the image data of memory 485a is divided in the shape of a matrix in the shape of a matrix. The

condition of this data is shown in memory 485b. Thus, the maximum brightness, the minimum brightness, and average luminance are called for for every block of each which was divided in the shape of a matrix.

[0555] In addition, in this specification, although the expression "brightness" is used, this shows the level (magnitude) of data, and a property. It does not become brightness only after data are processed and being displayed as an image, and brightness is not necessarily expressed for data itself on memory 485. Here, in order to make an understanding easy, or in order to give explanation easy, it is only called "brightness."

[0556] From the data (processed result) called for by memory 485b, luminance distribution, the light region number which has the brightness beyond a predetermined value, and the dark field number which has the darkness below a predetermined value are called for, and weighting processing is performed by the multiplier 761, respectively.

***** **** data are sent to data-processing circuit 762a. Data-processing circuit 762a changes the value of the weighting constant M at any time by considering the data for every frame and considering the change condition of image data. that is, the multiplier 761 from the past data -- each multiplier M is changed. This is because an image changes suddenly in having only carried out by frame processing, when an image changes from a bright screen to a dark screen suddenly with the following frame. Therefore, data-processing circuit 762a processes, following the variation of image data.

[0557] Data-processing circuit 762a processes the data inputted, and asks a display panel 21 for a proper gamma curve, a standup electrical potential difference, amplitude value, etc. A GAMMA curve is changed on the ROM table which consists of memory which it has inside. Moreover, in consideration of whether the configuration (division condition of a photoluminescence field) of a back light 16 has the shape of the shape of (a) full-screen package and a (b) stripe, and a (c) matrix, one of (a) - (c) is chosen, and data conversion is carried out and it outputs so that it may be the the best for the configuration. This video signal is transmitted to the source driver 102. The source driver 102 takes a gate driver 101 and the driver of a back light, and a synchronization, and displays an image.

[0558] (Drawing 77) is the explanatory view of the back light controller 105. Data processing is almost the same as that of a video-signal (drawing 76) processing circuit. A different point is a point which does not have the "dark field number" in the data for which it asks from memory 485b. In addition, the data with which a different point is outputted from data-processing circuit 762b are a point of distribution of the flashing period of emitters, such as a back light, flashing time amount, and a lighting location. These data are sent to the back light driver 104.

[0559] (Drawing 76) It was presupposed that the data which set and control a display panel 21 and a back light 16 from a video signal are formed (creation) (drawing 77). In addition, the phot sensor 781 may detect the display condition of the liquid crystal display panel 21 controlled to be shown in (drawing 78), the detected signal may be used as control data with a detector, and this control data may also be used. That is, a current display condition (there are problems, such as the response time, in liquid crystal) is fed back, and it considers as a better image display condition. The phot sensor 781 is stuck to the opposite substrate 222, and the light transmittance of the liquid crystal on the electrode 783 for detection formed specially is detected. It is good for the electrode for detection to constitute so that the average electrical potential difference of the display screen may be impressed.

[0560] Also in the case of self-luminescence molds, such as an organic electroluminescence display panel and FED, the drive method of (drawing 76) is applicable. In this case, what is necessary is just to change a gamma curve again.

[0561] Animation dotage is in the technical problem of the projection mold indicating equipment using the liquid crystal display panel 21 as a light valve. When a dynamic image is displayed as this animation dotage, or the profile of a dynamic image bleeds, it is the phenomenon which **** generates. This animation dotage is produced in the display panel which displays gradation not only using a liquid crystal display panel but using the period of one frame.

[0562] Since especially the responsibility of liquid crystal is bad, a liquid crystal display panel has large animation dotage, but in fact, even if this phenomenon makes responsibility of liquid crystal quick, it is generated. Therefore, the cure against animation dotage is generated common to the display panel of dot-matrix molds, such as the display of those other than CRT, for example, PDP, DMD (DLP), EL, etc. Therefore, the following matters, an approach, and equipment are applied to the display panel of a dot-matrix mold.

[0563] The above this invention mainly explained the display-panel display. If these indicating equipments etc. are used as a light valve, a projection mold indicating equipment and a viewfinder can be constituted, and if it uses as a monitor, a Personal Digital Assistant, a personal computer, television, etc. can be constituted. Henceforth, the various displays which mainly adopted the display of this invention, the display panel, the drive approach, etc. are explained.

[0564] (Drawing 79) is the block diagram of the projection mold display of this invention.

[0565] A display panel 21 uses the display panel of the invention in this application, a transfective type display panel, the DMD panel that TI, Inc. sells, TMA which South Korean Daewoo Corp. is developing, or a silicon chip DOBESU liquid crystal display panel. Although the case where it is the display panel of a transparency mold is explained here, when a display panel is a reflective mold, if PBS etc. is used, it can constitute in a reflective mold easily.

[0566] 794 of (drawing 79) is a turnable filter. A turnable filter 794 rotates a revolving shaft 142 as a core with a brushless DC motor 143. The turnable filter 794 is carrying out the configuration which combined the die clo IKKU filter (a die clo KUKKU mirror / color filter) 533 of fanning.

[0567] As shown in (drawing 81), the die clo IKKU filter (a color filter is sufficient) 794 is arranged in around a disk 802. Die clo IKKU filter 794R penetrates R light. Die clo IKKU filter 794G penetrate G light. Die clo IKKU filter 794B penetrates B light.

[0568] A disk 802 changes into R, G, and B light the white light which is incident light 18 by time sharing by rotating. The light changed into R, G, and B light is changed into parallel light by field lens 795a, and carries out incidence to a display panel 21. A display panel 21 modulates incident light, incidence of the modulated light is carried out to a projector lens 797, and expansion projection is carried out at a screen (not shown).

[0569] As shown in (drawing 80), the disk 802 is arranged in the case 804. The case 804 forms or consists of a metallic material or an engineering-plastic ingredient. The motor 143 is also arranged in the case 804. The transparency aperture 803 incident light 18 carries out [the aperture] close outgoing radiation is attached in the optical incidence section of a case 804. IR cut film which cuts UV cut film and infrared radiation which the AIR coat film (antireflection film) which prevents reflection of incident light is formed in the transparency aperture 803, and omit ultraviolet rays if needed is formed. The heat sink 805 which radiates heat in the heat in a case 804 is attached in some cases 804. Moreover, a Peltier device is sufficient as a heat sink 805.

[0570] It fills up with the hydrogen of one to three atmospheric pressures in the case 804. Since specific gravity of hydrogen is low, the windage loss generated when a disk 802 rotates can be decreased. Moreover, the heat dissipation effectiveness is high. However, hydrogen has the danger of exploding by mixing with oxygen. Therefore, the sensor 801 which measures the pressure and brightness of hydrogen to some cases 804 is attached.

[0571] A sensor 801 will emit a signal, if the pressure and/or purity of hydrogen in a case are measured and the concentration of hydrogen etc. becomes below constant value. While making the annunciator of "checking hydrogen concentration" with this signal turn on, luminescence of a lamp 791 is stopped.

[0572] The noise can be prevented by surrounding the perimeter of a disk 801 with a case 804 completely as much as possible. However, when it has opening in a case 804, hydrogen cooling system cannot be adopted. however, with the wind of a disk 802 — the electromagnetism of a sound and a motor 143 — the effectiveness of the noise abatement that a sound can be controlled good can fully be demonstrated. Moreover, the perimeter of a case 804 may be directly cooled with a liquid etc.

[0573] As shown in (drawing 80), the disk 802 is arranged in the case 804. The case 804 forms or consists of a metallic material or an engineering-plastic ingredient. The front face of a disk 802 or a filter 794 is good to form minute irregularity in a front face in order to reduce friction with air etc. It is good in it being irregularity like the surface section of a golf ball.

[0574] When a display panel 21 is a polarization modulation method, the plate which stuck the polarizing plate on the transparency aperture 803, or attached the polarizing plate in the transparence substrate is arranged to an optical path. Under the present circumstances, the plate furnished with the transparency aperture 803 or a polarizing plate is good to use the substrate in which sapphire glass or a diamond thin film was formed. It is because these have good thermal conductivity.

[0575] It is desirable to attach the micro-lens array 1112, as shown in a display panel 21 in (drawing 111), and to attach the acid-resisting substrate 1111 in a front face.

[0576] Minute irregularity (micro lens) is formed so that the micro-lens array 1112 may have periodic refractive-index distribution. A micro lens can be formed also by the ion exchange technique which Japanese Sheet glass is manufacturing. In this case, the front face of the micro-lens array 1112 serves as a plane. Moreover, the thing using the La Stampa technique may be used like OMRON Corp. or Ricoh Co., Ltd. In addition, there is a diffraction grating etc. as a configuration which has periodic refractive-index distribution. Moreover, there is also a method which generates a micro lens by impressing an electrical potential difference to macromolecule distribution liquid crystal. Since these can also generate the strength of light spatially, this can also use them. Moreover, a micro-lens array may be formed or produced rolling out a resin sheet or by carrying out press working of sheet metal.

[0577] However, generating will become [moire] intense if the formation pitch P_r of a micro lens and the formation pitch P_d of the pixel of a display panel 21 serve as specific relation. Therefore, constituting so that the following relation may be satisfied is important.

[0578] When the pitch of formation of the pixel pitch of a display panel of P_d and a micro lens 186 is set to P_r about moire, the pitch P of the moire to generate is $1/P = n/P_d - 1/P_r$. (formula 15)

It can express. It is $P_r/P_d = 2/(2n+1)$ that the maximum moire pitch serves as min. (formula 16)

It is at the ** time, and the modulation factor of moire becomes small, so that n is large. Therefore, it is good to decide P_r/P_d to fill (several 10). If it is 80% or more 120% or less of range of the value (it determined) calculated with (the formula 16), it is enough practically. First, what is necessary is just to determine n .

[0579] In addition, it is good for reducing generating of moire further to arrange the low diffusion sheet of the dispersion engine performance between the micro-lens array 1112 and a display panel 21.

[0580] When making a movie display good, it is good for OCB mode or deltan to use ultra high-speed large TN mode, antiferroelectric liquid crystal mode, and strong dielectric liquid crystal mode. Moreover, when using a display panel also as a reflective mold, it is good to use macromolecule distribution liquid crystal mode, ECB mode, TN liquid crystal mode, and the STN LCD mode.

[0581] Although (drawing 65) performed color display with one display panel 21, (drawing 114) realizes color display with three display panels 21. The polarizing plate 431 is stuck on the dichroic prism 1141 which compounds the image of three display panels 21. Moreover, the polarizing plate by the side of the optical incidence of a display panel 21 consists of sapphire glass. Or it is stuck on the transparence substrate 1142 in which the diamond thin film was formed. The micro-lens array 1112 and acid-resisting substrate 1111 grade which the configuration (drawing 27 (drawing 24 (drawing 23 (drawing 22)))) of a display panel 21 etc. is adopted, and are shown in (drawing 111) are attached.

[0582] The display panel 21, the dichroic mirror, and the transparent electrode 1142 are sealed with the case 804 shown by the dotted line, and as (drawing 80) explained, as for the interior of a case 804, it fills up with hydrogen. In addition, since the point that the heat sink 805 grade is attached in the exterior of a case 804 etc. is the same, explanation is omitted.

[0583] A UHP lamp, a METAHARA lamp, a xenon lamp, and a halogen lamp are adopted by the luminescence lamp 1141 like (drawing 79). When the arc length of a lamp sets the effective opposite length of a panel 21 to m (mm) like (drawing 79), arc length [of a lamp] L (mm) is set to $m/50 \leq L \leq m/20$, and f number F of a projector lens 797 is constituted so that the conditions of $1.5 \leq F \leq 3.0$ may be satisfied. Moreover, between a lamp 791 and a display panel 21, two integrator lenses 891 shown in (drawing 89) and prism arrays 871 are arranged.

[0584] The light emitted from the UHP lamp 791 is separated into the optical path of R-G-B light in three primary colors by dichroic mirrors 533a and 533b, G light is set to display-panel 21G, and R light sets incidence of the B light to display-panel 21B at display-panel 21R, respectively. A display panel 21 changes the orientation of liquid crystal corresponding to a video signal, respectively, and modulates light. Thus, the modulated R-G-B light is compounded with a dichroic prism 1141, and expansion projection is carried out with the projection lens 797 at a screen (not shown).

[0585] The band of the UVIR cut-off filter 1143 is 430nm - 690nm in the value of mesial magnitude. The band of R light sets the band of 600nm - 690nm and G light to 510-570nm. The band of B light is 430nm - 490nm. Each display panel 21 forms an optical image as change of a dispersion condition according to each video signal.

[0586] The perimeter of a display panel 21 is surrounded with a case 804, and the interior of **** 804 is filled up with hydrogen gas. When it provides the dichroic prism or PBS which compounds the light which possessed three liquid crystal display panels of display-panel 21B which modulate display-panel 21G which modulate display-panel 21R to which a projection mold display modulates red light, and green light, and blue glow, and these display panels 21 modulated, these display panels 21, die taro IKKU prism, etc. are surrounded by one **** 804, and the case 804 interior is filled up with hydrogen gas.

[0587] A sirocco fan is arranged in a case 804, and a heat sink is arranged in the case 804 exterior. A sirocco fan is arranged directly under display-panel 21B which modulates blue glow. This is because especially the **** side polarizing plate of the display panel which modulates blue glow tends to deteriorate with heat. Therefore, display-panel 21B is cooled preponderantly. Moreover, space is opened between the polarizing plate 431 by the side of optical incidence and optical outgoing radiation, and a display panel 21, and it constitutes so that hydrogen gas can flow between a polarizing plate 431 and a display panel 21. It is good for the front face of a polarizing plate 431 to form the antireflection film which consists of dielectric ***** of an inorganic material.

[0588] The air from a sirocco fan cools a display panel 21, and is sprayed on a heat sink. Moreover, in a case 804, it is good to station the circulation fan who circulates internal air.

[0589] Moreover, a heat sink is good to arrange the cooling fan which connects with the radiator arranged to the case 804 exterior, and cools this radiator. Moreover, it is good to attach in a case 804 the hydrogen concentration detector 801 which detects hydrogen leakage. Furthermore, what the case 804 is made into the explosion-proof construction for is desirable. As for hydrogen gas, it is desirable to fill up five or less atmospheric pressure more than per atmospheric pressure. As compared with air, the ratio of a consistency is 1/14, and hydrogen can decrease a fan's etc. windage loss. Moreover, the specific heat is high and the about 10-time cooling effect is high. Moreover, since it is inactive, it is hard to produce degradation of the liquid crystal display panel 21 etc.

[0590] what is limited to this although hydrogen gas is filled up with the above example in a case 804 -- it is not -- nitrogen -- although it passes and the cooling engine performance etc. falls by other gas, such as RIUMU, the cooling effect can be demonstrated rather than air. Moreover, even if it is the usual air, the effectiveness that adhesion of dust on the liquid crystal display panel 21 by sealing the inside of a case 804 can be prevented can be demonstrated. It cannot be overemphasized that it is applicable also to related matters (drawing 124 (drawing 80)), such as cooling by these hydrogen gas etc. and a case 804. Moreover, you may adopt it as a viewfinder.

[0591] With the configuration of (drawing 114), especially polarizing plate 431b by the side of incidence has the high rate of light absorption, and tends to deteriorate. A transparence substrate and 1142 are arranged in a case 1201 to be shown since it corresponds to this (drawing 120). As for the transparence substrate 1142, the diamond thin film is formed in the front face. Or since it consists of sapphire substrates, a heat transfer rate is high. The polarizing plate 431 is attached on this transparence substrate 1142.

[0592] In addition, a diamond thin film may be formed in a sapphire substrate or a front face for case 1201b, and a polarizing plate 431 may be directly attached in this case 1201b. in addition, image display -- the part through which an effective light passes -- an antireflection film 229 -- forming -- moreover -- other than this (invalid field) -- **** -- it is desirable to form the light absorption film or a light absorption member. Although the polarizing plate 431 is attached in the field which touches the coolant 1203 in the (drawing 120 (b)), it may not limit to this and a polarizing plate 431 may be attached in the field which touches the air of case 1201b. In this case, case 1201b is transmitted to the heat generated in polarizing plate 1201b, and it is cooled by the coolant 1203.

[0593] As for the coolant 1203, pure water, ethylene glucol, etc. are illustrated. In addition, it is desirable to add a sodium hydroxide etc. in the coolant and to make PH or less [10.5 or more] into 12.5. This is for preventing metal corrosion.

[0594] The heat sink 585 is attached in the periphery of a case 1201. Cooling can be efficiently done by spraying hydrogen or the usual air on this heat sink. Cooling of a heat sink 585 generates the convection current in the coolant 1203 (see the alternate long and short dash line arrow head). (drawing 120) In order to make this convection

current good, the spacer 1202 is formed in a case. The coolant is divided into three parts by this spacer 1202. The part of A is a field where the coolant 1203 descends. The part of B is a field where the coolant is heated and goes up. A spacer 1203 is arranged outside the width of face of a polarizing plate 431. By arranging a spacer 1202 as mentioned above, the good convection current occurs and a polarizing plate 431 can be cooled good.

[0595] In addition, the liquid crystal display panel 21 may be directly stuck on a case 1201. Moreover, it is good in 1201c as for the array substrate 221 or the opposite substrate 222 of the liquid crystal display panel 21. That is, it is the configuration filled up with the coolant 1203 between the opposite substrate 222 of a display panel 21, and case 1201b. However, what is necessary is to just be filled up with the coolant 1203 between this micro-lens array 1112 and case 1201b, when the micro-lens array 1112 is attached in the display panel 21, as shown in (drawing 111).

[0596] As shown in (drawing 111), when the micro-lens array 1112 is attached in the display panel 21, on these specifications, it considers as a display panel 21 by making these into one. That is, a display panel 21 does not mean only the light modulation layer 226 *(ed) by the opposite substrate 222 and the array substrate 221, and even if it is the configuration that the micro-lens array 1112, the acid-resisting substrate 1111, and scan substrate as shown in (drawing 39) 21b were added etc., it is called a display panel 21 including these. That is, it is the semantics of a display device.

[0597] That with which the back light 16 and the display panel 21 were united still (drawing 95) like may also mean a display panel 21. It cannot be overemphasized that what attached the add-on [like] of even if it is only calling it the light emitting device (drawing 123) is similarly meant also about light emitting devices 11/141. Moreover, as shown in (drawing 118), also when it may provide two or more light emitting devices 141 as shown in (drawing 122), and it is constituted in the shape of an array, it is a light emitting device.

[0598] In addition, it cannot be overemphasized that it is not limited to this although the above example explains a projection mold indicating equipment as an example, and application expansion can be carried out at a viewfinder, a head mount display, an accepting-reality monitor, etc.

[0599] Hereafter, the viewfinder of this invention is explained. In addition, on these specifications, the image display device (light modulation means) which are not the light sources (optical generating means), such as a light emitting device, and self-luminescence forms, such as a liquid crystal display panel, at least is provided, and what both were united and consisted of is called a viewfinder.

[0600] Moreover, the camera which records an image on disks other than the camera using a video tape, such as FD, MO, and MD, with a video camera, an electronic "still" camera, a digital camera, and the electronic camera recorded on solid-state memory also correspond.

[0601] (Drawing 82) is a sectional view for explanation of the viewfinder of this invention. The viewfinder of (drawing 82) uses the display panel 21 of this invention. It is desirable to use especially PD liquid crystal display panel. The convex lens 795 is arranged in the outgoing radiation side of a display panel 21.

[0602] A convex lens 795 also has the function which condenses the light modulated in the liquid crystal layer 226. Therefore, to the effective diameter of a display panel 21, the effective diameter of a magnifying lens 824 is small, and ends. therefore, the magnifying lens 824 -- small -- it can carry out -- a viewfinder -- low-cost-izing -- and-izing can be carried out [lightweight].

[0603] In addition, a display panel 21 may use the display panel of a polarization method like TN liquid crystal display panel.

[0604] The magnifying lens 824 is attached in the eyepiece ring 823. By adjusting the location of the eyepiece ring 823, focus adjustment can be performed in accordance with the diopter of an observer's eye 826. Moreover, in order for an observer to make an eye 826 close to the eyepiece covering (eye cap) 825 and to see a display image, a technical problem is not generated even if the directivity of the light from a back light 16 is narrow.

[0605] The transparence block 716 is a concave mirror centering on a focus 0, as shown in (drawing 84), and it is changed into parallel light by reflecting the light emitted from the focus 0 in Reflector c. However, if what this invention uses is not limited to a perfect parabolic mirror and the light as which an ellipsoidal mirror etc. is sufficient and which is got blocked and emitted from the source of luminescence is changed into abbreviation parallel light, it is good anything. In this invention, the slash section in (drawing 84) is used as transparence block 821. Moreover, a light emitting device may not be limited to the point light source, and the linear light source is sufficient as it like thin fluorescence tubing. In this case, a two-dimensional paraboloid is sufficient as a paraboloid.

[0606] A use part is the slash section when a light emitting device 11 is the point light source, as shown in (drawing 82). Film, such as aluminum, is vapor-deposited in this use section, and a reflector 831 (refer to drawing 83) is formed in a rear face at it. What used an others and dielectric mirror or the diffraction effect is sufficient as a reflector. [metallic material / of aluminum and Ag] Moreover, a reflector 831 may be formed and attached in other members.

[0607] Incidence of the light emitted from white LED 11 is carried out to the transparence block 821. The light which carried out incidence is changed into a narrow directive light, and carries out incidence to a display panel 21, it is condensed with the field lens 795 and incidence of it is carried out to a magnifying lens 821. The field lens 795 is formed with polycarbonate resin, ZEONEX resin, acrylic resin, polystyrene resin, etc. The transparence block 821 is also formed with the same ingredient. The transparence block 821 is formed by the polycarbonate especially. Wavelength dispersion of a polycarbonate is large. However, if it uses for an illumination system, the effect of a color gap will completely be satisfactory. Therefore, it should form with the polycarbonate resin which can employ efficiently the property that a refractive index is high. Since the refractive index is high, the curvature of a

paraboloid can be made loose and a miniaturization becomes possible. Of course, you may form with the glass which consists of organic or inorganic. Moreover, what was filled up with gel or a liquid in the lens-like (it has shape of concave surface) case may be used. Moreover, the shape of a bowl of the concave surface which processed a part of paraboloid has (some usual concave mirrors instead of a transparence member are used).

[0608] In addition, when a reflector 831 is formed with metal thin films, such as aluminum, in order to prevent oxidation, the coat of the front face is carried out by UV resin etc., or it coats with SiO₂, magnesium fluoride, etc.

[0609] In addition, a reflector 831 is formed with a metal thin film, and also it may stick a reflective sheet and a metal plate. moreover -- or a paste etc. may be applied and formed. Moreover, the reflective film may be formed in another transparence block etc., and said reflective film may be attached in the transparence block 821. It is good also considering the optical interference film as a reflector 831. This invention arranges a light emitting device 11 into the part of 0, as shown in (drawing 84), and it illuminates this as a core.

[0610] A light emitting device can use a thing with directivity. That is, it is because the lighting range C is narrow. Therefore, efficiency for light utilization is good. It is because light can be illuminated from effectiveness in a narrow lighting area.

[0611] LED with a small (white) light-emitting part is the optimal in this semantics. In addition, the arrangement location of a light emitting device is shifted from Focus O to order. The magnitude of the luminescence area of a light emitting device only changes seemingly. Luminescence area will become large if it is made longer than a focal distance. If it is made shorter than a focal distance, lighting area will usually become small.

[0612] As shown in (drawing 85), in this invention, the center section (B, B') of the parabolic mirror is not used. That is, the part which carried out eccentricity like a parabola is used. Therefore, the light emitted from a light emitting device 11 uses the thing of the range of 18B to 18A.

[0613] From the above thing, the inferior-surface-of-tongue location of a light emitting device is not further used as a passage field of the illumination light using a half part from the center line of a parabolic mirror.

[0614] When it considers as diagonal length [of the effective viewing area of a display panel 21] m (mm), and (refer to [whose observer who the pixel etc. is formed and sees the image of a viewfinder is seen by the image] the field (drawing 83) (drawing 86)) and is referred to as focal distance [of a parabolic mirror] f (mm) (refer to drawing 85), it is made to satisfy the following relation.

[0615]

$m / 2(\text{mm}) \leq f(\text{mm}) \leq 3/2$, and $m(\text{mm})$ (formula 17)

The curvature of a short paddle and a paraboloid becomes [f (mm)] small from m/2 (mm), and the formation include angle of a reflector 831 becomes large. Therefore, ***** of a back light becomes long and is not desirable. Moreover, if the include angle of a reflector 831 is tight, the technical problem that it becomes easy to generate a brightness difference in the upper and lower sides or right and left of the viewing area of a display panel 21 will also be generated.

[0616] On the other hand, if f (mm) is longer than 3/2, and m (mm), the curvature of a paraboloid will become large and the arrangement location of a light emitting device (light-emitting part) will also become high. Therefore, ***** of a back light will become long like the point.

[0617] When white LED is a chip type, the diameter of a luminescence field is 1 (mm) extent. When a paraboloid is large, or when the diagonal length of the effective viewing area of a display panel is long, in the diagonal length of a diameter 1 (mm), it may be small. That is, the directivity of the light which carries out incidence to a display panel 21 becomes narrow too much. Although based also on the field angle design of a magnifying lens 824, if the luminescence field of a light emitting device 11 is small, and the location of an eye is released off the eyepiece covering 825 for a while, a display image will disappear. In this case, as shown in (drawing 82), it is good for an optical outgoing radiation side to arrange diffusion plate 22a etc. Moreover, what is necessary is to arrange a diffusion plate to the outgoing radiation side of a light emitting device 11, and just to enlarge luminescence area on appearance.

[0618] White LED 11 performs a constant current drive. The luminescence brightness change by temperature dependence becomes small by performing a constant current drive. Moreover, LED11 can reduce power consumption, making luminescence brightness high by performing a pulse drive. The duty ratio of a pulse is set to $1 / 2 - 1/4$, and a period is set to 50Hz or more. A flicker occurs that a period is low 30Hz.

[0619] When the diagonal length (diagonal length of a field effective in the image display which an observer looks at) of the effective viewing area of a display panel 21 is set to m (mm), as for diagonal length [of the luminescence field of LED11] d (mm), it is desirable to satisfy the following relation.

[0620]

$(m/15) \leq d \leq (m/2)$ (formula 18)

It is desirable to satisfy the following relation still more preferably.

[0621]

$(m/3) \leq d \leq (m/10)$ (formula 19)

If d is too small, the directivity of the light which illuminates a display panel 21 will become narrow too much, and the display image which an observer looks at becomes dark too much. On the other hand, if d is too large, the directivity of the light which illuminates a display panel 21 will become large too much, and contrast will fall [a display image]. When the diagonal length of the effective viewing area of a display panel 21 is 0.5 (inch) (about 13 (mm)) as an example, as for diagonal length or a diameter, 2-3 (mm) are [the luminescence field of LED] proper. By arranging, or it sticks a diffusion sheet on the optical outgoing radiation side of an LED chip, luminescence area size can

realize magnitude which suited the target easily. Moreover, the light emitting device 11 is attached in the flexible substrate 833.

[0622] Abbreviation parallel light may be a beam of light which spreads even if it is the semantics of a directive narrow light and is the beam of light which does not mean a perfect parallel light and is narrowed down to an optical axis. That is, it uses in the semantics of the light which is not a source of the diffused light like the surface light source.

[0623] applying with a natural thing comes out of the above thing also to the display of other this inventions -- coming -- **

[0624] In order to absorb the light scattered about in the liquid crystal layer 226, or in order to control the halation light in a lens side, it is desirable to make the inside of the body 822 into black or the dark color. It is for absorbing the scattered light with the body 822. It is effective to apply the charge of black-colored to the invalid field (field part which a light effective in image display does not pass) of a display panel 21.

[0625] The liquid crystal layer 226 is based on the strength of the electrical potential difference impressed to the pixel electrode 230, and makes incident light scatter about or penetrate. A transmitted light passes a magnifying lens 824 and reaches an observer's eye 826.

[0626] Since the eyepiece covering (eye cap) 824 grade is fixed, the range which an observer sees in a viewfinder is very narrow range. Therefore, even if it illuminates a display panel 21 with a narrow directivity light, sufficient angle of visibility (visual field range) is realizable. Therefore, the power consumption of the light source 11 is sharply reducible. the viewfinder using the display panel 21 of 0.5 (inch) as an example -- setting -- a surface light source method -- the power consumption of the light source -- 0.3-0.35 (W) -- although it was required, the brightness of the same display image was realizable by 0.02-0.04 (W) with the viewfinder of this invention.

[0627] An observer fixes an eye 826 with the eyepiece covering (eye cap) 825, and sees a display image. Adjustment of a hint is performed by moving the eyepiece ring 823. In addition, the light source 11 may not be limited to one and may be plural.

[0628] In addition, it is desirable between a display panel 21 and the transparence block 821 to carry out optical coupling by transparence resin 126. Moreover, in order to prevent the optical leakage from the periphery of a display panel 21, it is desirable to arrange the ring-like protection-from-light object (gobo) 832. A gobo 832 may carry out immediate printing printing at the transparence block 821. By arranging a gobo 824, the alignment of the transparence block 821 and a display panel 21 becomes easy.

[0629] (Drawing 82) was an example which uses the display panel 21 of a transparency mold. (Drawing 87) is the example of the viewfinder which used the display panel or the transfective type display panel 21 of a reflective mold as a light valve.

[0630] What is shown in (drawing 84) as a back light is used. Therefore, in case incidence of the light emitted from the light emitting device 11 is carried out to PBS871 (light 18b and 18a), when driving by the field sequential method changed into abbreviation parallel light, it uses LED of three colors of R, G, and B as a light emitting device 11. What is necessary is to synchronize these with the video signal impressed to a display panel 21, and just to blink them. However, even if it clusters LED of R, G, and B and arranges, it cannot arrange in the same location completely. When there was a location gap and it sees from a magnifying lens 824, emitter 11 location has come to shift, and an irregular color occurs in a display image. In order to control this, the diffusion plate has been arranged to the optical outgoing radiation side of LED of R, G, and B, and he enlarges an emitter image and is trying to arrange the light emitting device of R, G, and B in the same location seemingly in this invention.

[0631] As for the light which carried out outgoing radiation from the transparence block 821, S polarization 18a is reflected in respect of [872] optical separation of PBS871. P polarization 18b penetrates. What is necessary is just to form the light absorption film 878 like (drawing 87), in order to prevent the halation by this transmitted light 18b. Moreover, in order to prevent the light reflected irregularly within PBS871, as for the light absorption film 878, it is desirable to form or arrange to an invalid field (field which a light effective in image display does not penetrate).

[0632] A display panel 21 modulates incident light 18a, and changes S polarization into P polarization according to the modulation rate. Changed optical 18c penetrates the optical separation side 872, and it carries out incidence to a magnifying lens 824.

[0633] In addition, a magnifying lens 824 may be constituted combining two or more lenses like (drawing 87). Moreover, when a display panel 21 is a transfective specification, not using a light emitting device 11, ** can also display an image by arranging back light 16b, as shown in (drawing 87). Moreover, a daylight display is realizable by making coincidence turn on a light emitting device 11 and back light 16b.

[0634] When a display panel 21 is PD liquid crystal display panel, the configuration illuminated from [of a display panel 21] across as shown in (drawing 88) may be used. Incident light is scattered, it becomes irregular and PD liquid crystal display panel 21 generates scattered-light 18b. It is because an image is displayed when a part of this scattered-light 18b carries out incidence to a magnifying lens 824.

[0635] (Drawing 89) is the configuration of providing the polarization conversion prism 871. Two or more lenses carry out incidence of the light emitted from the light emitting device 11 to the integrator lens (1st lens 891a, 2nd lens 891b) arranged in the shape of two-dimensional. The polarization conversion prism 871 is arranged at the outgoing radiation side of the integrator lens 891. The polarization conversion prism 871 combines two or more minute prism which consists of a mirror 892 and $\lambda/2$ plate 893. By using this prism component 871, S polarization can be changed into P polarization and outgoing radiation of the P polarization can be carried out with P polarization.

[0636] (Drawing 90) forms abbreviation parallel light by the light emitting device 11 and lens 795a, and it is made it to carry out incidence to PBS871 not using a transparence block. Moreover, the concave mirror 792 is used auxiliary.

[0637] (Drawing 90 (b)) indicates physical relationship with the light emitting device 11 section to be lens 795a. 11W of 11R, 11G, 11B, and white luminescence are arranged as a light emitting device, and the diffusion plate 22 is arranged in this optical outgoing radiation side. Instead of the diffusion plate 22, the mold of the light emitting devices 11R, 11G, 11B, and 11W may be carried out by resin with optical diffusibility etc.

[0638] the drive of a display panel 21 — the field — when sequential, the light emitting device of 11R, 11G, and 11B is made to turn on by turns. When a display panel 21 has color filters, such as a resin color filter and a holography color filter, make only 11W turn on, make coincidence turn on three, 11R, 11G, and 11B, or four light emitting devices, 11W, 11R, 11G, and 11B, are made to turn on, and the white light is irradiated at a display panel 21. Under the present circumstances, the light emitting device of 11R, 11G, and 11B is controlled independently, and it enables it to maintain the color balance of the white light.

[0639] in addition — etc. (drawing 90) etc. — it may set and display-panel 21b may be arranged to A in a location. A highly minute image can be displayed by arranging display panels 21 and 21b. Moreover, efficiency for light utilization can also be raised. The image for three dimensional displays may be displayed on display panels 21 and 21b.

moreover, the display panel 21 — two colors of R and B — the field — it is sequential, and it displays and is good also considering display-panel 21b as a display of G. That is, the image of two colors may be displayed on one display panel, and the one remaining colors may be displayed on the display panel of another side. The matter about these configurations is the same also about (drawing 87). That is, what is necessary is just to arrange display-panel 21b in the part of B of (drawing 87).

[0640] The configuration of the reflector 15 of the transparence block 821 changes with focal locations O, as shown in (drawing 140). That is, it changes with focal distances f. As shown in the (drawing 140 (a)), as for the curvature of a reflector 831, f becomes loose when long, and thickness t of the transparence block 821 becomes thin. That is, a lighting system (back light) 16 can be formed small thinly.

[0641] Therefore, it links [with the miniaturization of a viewfinder] directly and is desirable to enlarge a focal distance f. However, if it constitutes as shown in the (drawing 140 (a)), it is shaded with a display panel 21 (a dotted line shows), and optical 18a emitted from the light source 11 cannot make a reflector 831 carry out incidence. After reflecting the light from the light source 11 once by reflector 831a and then carrying out total reflection on the front face A of the transparence block 821 as shown in the (drawing 140 (b)) since this technical problem is coped with, the configuration which is made to reflect in reflector 831b and carries out incidence to a display panel 21 can be considered.

[0642] However, with the configuration of the (drawing 140 (b)), theta will become an include angle below [all] a critical angle whenever [incident angle / of the light reflected on a front face A]. Therefore, it will not reflect, but will attach and escape from the light which carried out incidence to the range of A. Therefore, a part of viewing area of a display panel 21 cannot be illuminated.

[0643] The (drawing 141 (a)) is the configuration of having performed this cure. The transparence block 821 consists of transparence blocks 821a and 821b. Transparence block 821b is made into the shape of a wedge. The transparence blocks 821a and 821b are made to hold by the attaching part 1411 in a periphery.

[0644] The magnitude of the air gap 1351 satisfies the same relation as (drawing 135). Drawing 138 Moreover, explain by the configuration approach of the air gap 1351 etc. The formation include angle theta 2 (DEG.) of transparence block 821b satisfies 2 degree $\leq \theta_2 \leq 20$ degree conditions. It is desirable to satisfy 3 degree $\leq \theta_2 \leq 10$ degree conditions still more preferably.

[0645] By constituting, as shown in the (drawing 141 (a)), it is reflected by reflector 831a and total reflection of the optical 18a emitted from the light source 11 is carried out by the interface with the air gap 1351. Under the present circumstances, theta 3 fully becomes more than a total reflection include angle (critical angle) by wedge-like transparence block 821b whenever [angle-of-reflection / of optical 18b]. Therefore, all optical 18b is reflected, and incidence is carried out to reflective film 831b, it becomes 18d of reflected lights, and a display panel 21 is illuminated (not shown [the display panel 21]). (Drawing 82) Reference (drawing 83).

[0646] 18d of reflected lights goes the inside of transparence block 821a and 821b straight on. If there is no transparence block 821b, it will be greatly refracted with the Snell's law. That 18d of light goes straight on as mentioned above is the effectiveness used combining the transparence blocks 821a and 821b. Moreover, in the viewing area of a display panel 21, since it is uniform, the air gap 1351 does not affect image display. In addition, the slant face of transparence block 821b is good also as a curved surface or the spherical surface, as shown in the (drawing 141 (b)).

[0647] The light source 11 is in a seemingly high location (when not bending an optical path), and when the distance (focal distance) to the reflective film 831 is beyond a predetermined value, as the light source 11 is shown in (drawing 144), wedge-like transparence block 821b may be made into hard flow as compared with the (drawing 141 (a)). The include angle theta 2 is the same as that of (drawing 141).

[0648] In (drawing 144), it is reflected by reflector 831a cut aslant, and optical 18a emitted from the light source 11 is reflected by the interface with an air gap. Under the present circumstances, whenever [angle-of-reflection / of optical 18b] fully turns into more than a total reflection include angle (critical angle), when theta 3 is having wedge-like transparence block 821b arranged. Therefore, all optical 18b is reflected, and incidence is carried out to reflective film 831b, it becomes 831d of reflected lights, and a display panel 21 is illuminated.

[0649] 18d of reflected lights goes the inside of transparence block 821a and 821b straight on like (drawing 141). 18d of light which penetrated the display panel 21 is set to focusing light 18e with a condenser lens 795. Therefore, the diameter of a lens of the magnifying lens 824 of a viewfinder can be made small.

[0650] In addition, also as for between a lens 795 and a display panel 21, it is desirable to carry out optical coupling by transparence resin, the transparence liquid, transparence gel, etc.

[0651] Moreover, what is necessary is just to constitute, as shown in (drawing 146) when a display panel 21 is a reflective type (or transfective specification). The transparence blocks 821a and 821b are used. As for θ_4 (DEG.), it is desirable to consider as $40 \text{ degree} \leq \theta_4 \leq 55 \text{ degree}$.

[0652] In (drawing 146), optical 18a emitted from the light source 11 is changed into the light of abbreviation parallel light by lens 795b, and carries out incidence to transparence block 821a. It is reflected by the interface with the air gap 1351, and optical 18a which carried out incidence is set to reflected light 181b, and carries out incidence to a display panel 21. Optical 181c modulated with the display panel 21 goes the inside of transparence block 821a and 821b straight on. Optical 18c which penetrated transparence block 821b becomes focusing light with a condenser lens 795 like (drawing 144), and carries out incidence to a magnifying lens 824.

[0653] In addition, optical coupling of between lens 795b and transparence block 821b may be carried out by transparence resin, the transparence liquid, transparence gel, etc. Moreover, transparence block 821b and a lens 795 may be formed as one. Moreover, when a display panel 21 is a transfective specification, as shown in (drawing 146), a back light 16 may be arranged at the rear face of a display panel 21.

[0654] In addition, as shown in the (drawing 141 (b)), transparence block 821a may be formed in the shape of radii, may be formed in the shape of the spherical surface, or may be formed in the aspheric surface and a polygon. Transparence block 821a is formed or constituted so that the air gap 1351 may become fixed in accordance with the configuration of transparence block 821b. However, in order to give the lens effectiveness to transparence block 821b etc., the air gap 1351 may be changed by the center section and periphery of a display panel 21. Moreover, (drawing 141 drawing 142 drawing 144), it sets, and reflector 831a may consider as a curved surface, and may give a lens function.

[0655] Moreover, the refractive index of the transparence blocks 821a and 821b may use that from which a refractive index differs in consideration of chromatic aberration. Moreover, the transparence block 821 may be made to color. It cannot be overemphasized that the configuration of other configurations (drawing 83 (drawing 82)) is applied.

[0656] Moreover, it cannot be overemphasized that the reflector 831 of the transparence block 821 may not be limited to the paraboloid of a three dimension, and it may be ellipsoid, or you may be two-dimensional [-like], either. Moreover, minute irregularity may be formed in the optical outgoing radiation side of the transparence block 821, and directivity may be expanded. Moreover, it is desirable to form the light absorption film in the field through which a light effective in image display does not pass.

[0657] Moreover, as shown in (drawing 142), transparence block 821b is good for there to be nothing. The liquid crystal display panel 21 is arranged to the optical outgoing radiation side of transparence block 821a. Depending on the arrangement location of the liquid crystal display panel 21, 18d of light will carry out incidence to the liquid crystal display panel 21 aslant. When the liquid crystal display panel 21 is a normally white mode, whenever [incident angle / of the direction of orientation of a liquid crystal molecule and 18d of light] is in agreement, and contrast is raised.

[0658] In addition, (drawing 83 (drawing 82)), also in a configuration, as shown in (drawing 143), the transparence block 821 may be aslant arranged to the liquid crystal display panel 21. Moreover, as shown in the liquid crystal display panel 21 in (drawing 142), it may be made to carry out incidence in the direction of slant. As the reflective film 15 shows, the reflective film 15 may be arranged or formed in the front face of the transparence block 821, and moreover (drawing 143) may be constituted so that it can reflect, even if incident light 18b is below a critical angle. Moreover, it cannot be overemphasized that it is desirable to constitute from LED of R, G, and B etc. and to make it correspond to a field sequential display as (drawing 90) explained the light emitting device 11.

[0659] As shown in (drawing 145), a convex lens 795 may be arranged to transparence block 821b at an outgoing radiation side. Moreover, molding processing may be carried out, using a lens 795 and a transparence block as one. As for the case of a reflective mold etc., a display panel 21 may arrange a convex lens 795 to the outgoing radiation side of transparence block 821b, as similarly shown in (drawing 147). Moreover, transparence block 821b and a convex lens 795 may be unified and formed.

[0660] (Drawing 148) is a method which condenses optical 18c reflected regularly with the reflector 230 of a display panel 21 with a magnifying lens 824. In the case of the PD display panel 21, it becomes NB mode display. Since reflected light 18c advances to the slanting approach, the include angle of θ_5 is given to an outgoing radiation side for transparence block 821b, and the direction of the outgoing radiation light from transparence block 821b is bent (18d). A color filter (not shown) may be arranged to the optical plane of incidence of a lens 795, and lens 795 self may be colored. In addition, it is desirable to form the light absorption film 146 in an invalid field.

[0661] (Drawing 149) is a configuration incidence of the light is carried out [configuration] to reflective mold display-panel 21 grade with one transparence block 821. Total reflection of the light emitted from the light emitting device 11 is carried out by A of the transparence block 821, and it carries out incidence to the liquid crystal display panel 21. The liquid crystal display panel 21 is PD liquid crystal display panel, and is NW mode display. Therefore, the scattered light carries out incidence to a lens 795, and an image is displayed. If constituted as mentioned above (drawing 88) does not need to illuminate a display panel 21 from the slanting upper part like. Therefore, a viewfinder

can be constituted in a compact. In addition, as for θ (DEG.), it is desirable to constitute so that it may be set to $40 \leq \theta \leq 55$. Since other matters are the same as the contents explained so far, explanation is omitted. The same is said of drawing 150 Drawing 151 Drawing 152 This.

[0662] As for (drawing 150), as a display panel 21 which is the configuration which illuminates a display panel 21 using two or more transparence blocks 821, it is desirable to adopt PD liquid crystal display panel. It is made for the include angle θ_6 (DEG.) of the chief ray which carries out incidence to be set to $30 \leq \theta_6 \leq 75$, and is preferably made satisfied [include angle] with a display panel 21 of the relation of $40 \leq \theta_6 \leq 60$. As shown in the (drawing 151 (a)), four are sufficient as the transparence block 821. The viewing angle of a display panel 21 becomes large, so that more than increases in the transparence block 821, and a display image also becomes bright. Moreover, if it constitutes as application of (drawing 124) as shown in the (drawing 151 (b)), the viewfinder of a reflective mold can be constituted.

[0663] The configuration of a display panel 21 etc. is made to be the same as that of (drawing 124). Color separation of the light emitted from the lamp 11 is carried out with a dichroic mirror 533, and the three-primary-colors light by which color separation was carried out carries out incidence to a display panel 21 at an angle of a chief ray different, respectively (drawing 152). Thus, by constituting, a color filter is not formed but ** can also realize color display with the display panel 21 of one sheet.

[0664] In addition, in the configuration of the viewfinder of this invention, if a magnifying lens 824 is removed, it cannot be overemphasized that it is applicable also as a direct viewing type display. That is, the configuration of the viewfinder of this invention is not limited to a viewfinder, and may be used also as a common display. It is applicable also to the drawing 114 (drawing 79) projection mold display of the same thing etc. A projector lens 797 is removed, and if it constitutes so that the accepting-reality observation of the display image of a display panel 21 can be carried out, it will become a viewfinder and will also become the display of a direct viewing type.

[0665] (Drawing 91) is the configuration of having used it for the body 912 of a video camera, having used the display panel of this invention etc. as the monitor. (drawing 92) -- a part of (drawing 91) -- it is a sectional view. As shown in (drawing 92), the display panel is attached in covering 915a, and the parabolic mirror 921 is attached in covering 915b. After being able to pile up and piling up, Coverings 915b and 915a are constituted so that it can contain in the insertion section 913 of the body 912 of a camera.

[0666] The parabolic mirror 921 consists of reflective mold Fresnel lenses. When curvature is loose, of course, it is not necessary to consider as the shape of a Fresnel lens. Moreover, by rotating the supporting points 914a and 914b, the include angle of a parabolic mirror 921 and a display panel 21 is constituted so that an observer can adjust to a legible include angle.

[0667] The taking lens 911 and the viewfinder are attached in the body 912 of a video camera. Moreover, the image transfer switch 935 and a monitor line 936 attach, or are arranged. These are explained later.

[0668] Arrangement of a light emitting device 11, a parabolic mirror 921, and a display panel 21 has become like (drawing 94). That is, the light emitting device 11 is arranged in the focus of a parabolic mirror 921, or its zero near. Optical 18a emitted from the light emitting device 11 is changed into abbreviation parallel light 18b with a parabolic mirror 921. A display panel 21 is illuminated by this changed optical 18b. An observer justifies coverings 915a and 915b so that a display image may become the most legible. in addition -- etc. (drawing 90) etc. -- **** -- although explained, a light emitting device 11 is not limited to white. It cannot be overemphasized that three colors of the three primary colors of R, G, and B or cyanogen (C), yellow (Y), and magenta (M) are sufficient in a field sequential drive.

[0669] Although reflective mold Fresnel lens 921 vapor-deposited all layer membranes at the front face or rear face of a Fresnel lens, polish processing or the thing which carried out press working of sheet metal is sufficient as it in others and a metal plate.

[0670] If it is made the configuration of (drawing 92), parallel light is created easily and a display panel 21 can be illuminated by this parallel light 18b. The light emitted from white LED 11 is changed into abbreviation parallel light (only a still more perfect parallel light is not meant) with a concave mirror. It illuminates from [of a display panel 21] across using the light changed into parallel light. Moreover, a diffusion sheet is arranged in an optical path to prevent generating of the moire by the Fresnel lens if needed.

[0671] The light emitting device 11 is arranged in the focal location O of a parabolic mirror. Moreover, three-dimension-like a thing or a two-dimensional thing is sufficient as a Fresnel lens. When a light emitting device 11 is the point light source, a three-dimension-like (concentric circular) thing is adopted. In the case of-like [rod], a light emitting device 11 uses that in which irregularity was formed in the shape of-dimensional [2] like fluorescence tubing. Optical 18a emitted from the light emitting device 11 is changed into parallel light 18b with a parabolic mirror 921. Incidence of the changed optical 18b is carried out to a display panel 21 at an include angle θ . This include angle θ is the problem of a design, and reflected light 18c is carried out as [be / to an observer / the most legible] (or reaching and twisting to an observer's eyes most like).

[0672] An observer does movable [of the free wheel plate] with the supporting point 914, and adjusts a display image to a legible location most. In the example of (drawing 92), since it has the two supporting points 914a and 914b, the direction of the illumination light etc. can be adjusted easily.

[0673] When not using a display panel 21, covering 915 is set and shut in the front face of a display panel 21, movable [of the supporting-point 914a] is carried out, and it contains in the storing section shown in (drawing 92). Therefore, compactability is realized. Moreover, when it can illuminate enough, a concave mirror 921 may be reset to a mere mirror. Moreover, the color temperature of the illumination light of a display panel can be set as the optimal

temperature by the concave mirror or the mirror by arranging or forming the color filter etc. in the concave mirror 921 or the mirror.

[0674] For adjusting, a device is required so that the contrast of the display image of a display image may be looked the best. It is because the include angle which looks good changes with contents of the image where graphic display is carried out to a display image. For example, on the screen of a blackish scene, the include angle of a display panel 21 will be inevitably adjusted focusing on black, and the include angle of a display panel 21 will be adjusted focusing on a white display on the screen of a whitish scene. However, when an image is a video image (animation), since a scene changes rapidly, it cannot be adjusted very much the optimal.

[0675] This invention forms a monitor line 936 in order to solve this technical problem. (Drawing 91) is one example which prepared monitor line 936a of a black display, and monitor line 936b of a white display. However, both monitor lines 936a and 936b are not surely required, and the need is accepted, while it is good.

[0676] Monitor line 936a shows the black display of an image. Monitor line 936b shows the white display of an image. As shown in drawing 81, an observer adjusts covering 915 grade and adjusts the include angle which looks at the display screen so that a black display and white display of a monitor line 936 may be best.

[0677] The monitor line 936 shows the light modulation condition of the liquid crystal layer 226. That is, a monitor line 936 is formed in the part where it filled up with the periphery and liquid crystal of a display panel 21.

[0678] The monitor electrode is formed in monitor line 936a of a black display, and alternating voltage is continuously impressed to the counterelectrode 225 and the monitor inter-electrode liquid crystal layer. This alternating voltage is an electrical potential difference which serves as a black display of an image most. Moreover, an electrode is not formed in the part of the liquid crystal layer 226 of monitor line 936b of a white display, but it is always in a dispersion condition (white display).

[0679] An observer adjusts the include angle of the display screen, adjusting so that a white display and a black display may become the best, looking at this A section (monitor line 936a) and the B section (monitor line 936b). Therefore, the display screen cannot be seen, but easily [**], include-angle adjustment can be performed to best so that it may become the display contrast of a display image.

[0680] There is nothing that is limited to this, although [a monitor line 936] constituted using the liquid crystal layer 226. For example, what has formed or arranged reflective film (reflecting plate etc.) at the rear face of a transparence substrate is sufficient as monitor 936a. That is, the liquid crystal layer 226 of transparence is produced in false. This will show a black display.

[0681] Moreover, what has formed or arranged reflective film (reflecting plate etc.) at the rear face of a diffusion plate (diffusion sheet) is sufficient as monitor 936b. The dispersion property of a diffusion plate is made into the property and EQC of the liquid crystal layer 226. This will show a white display. Moreover, a reflecting plate or a diffusion plate (sheet) can also only be substituted.

[0682] A monitor line 936 can be constituted by forming or arranging in false above liquid crystal layers 226 and things made to approximate.

[0683] In addition, a monitor line 936 may manufacture and use the panel only for monitor lines separately from a display. At least one side is formed in the panel only for monitor lines among black display 936a and white display 936b. It attaches, or it builds this exclusive panel into a graphic display device.

[0684] Moreover, when a display panel 21 is a transparency mold display panel, it cannot be overemphasized that what is necessary is just to use that to which production etc. carried out the liquid crystal layer of this display panel or the false panel. Moreover, a monitor line 936 may not be limited to the thing of the shape of a dot, and small area, in the shape of a frame, may be formed, for example, may produce a monitor line 936, and it may arrange it so that the periphery of a viewing area may be surrounded.

[0685] Although a monitor line 936 mainly explains the case where a display panel 21 is a PD display panel, it cannot be limited to this, and also in the case of other display panels (a STN liquid crystal display panel, an ECB display panel, a DAP display panel, TN liquid crystal display panel, a strong dielectric liquid crystal display panel, the DSM (dynamic scattering mode) panel, the perpendicular (orientation VA) mode display panel, an IPS mode display panel, guest host display panel, etc.), it can be applied. Moreover, these matters are applicable also to EL display panel, an LED display panel, a plasma addressing display panel, a FED display panel, and a PDP display panel.

[0686] For example, by TN liquid crystal display panel, the liquid crystal layer for monitors is actually formed for one [at least] display monitor 936 among black displays with a white display, or the display monitor section 936 of a liquid crystal layer and equivalence is formed in false. It is also the same as when [also when a reflector is a mirror plane] minute irregularity is formed.

[0687] A display panel 21 is not limited to the graphic display device which used the display panel of a reflective mold, and can apply the technical thought which arranges a monitor line 936 also to the graphic display device using the display panel of a transparency mold. It is because it is same in case of a transparency mold if a display panel is a reflective mold with the concept of acting as the monitor of the monochrome display condition.

[0688] Moreover, it cannot be overemphasized that the technical thought of this monitor line 936 can apply the display image of a display panel not only to the indicating equipment which carries out direct observation but to graphic display devices, such as a viewfinder, a projection mold indicating equipment (projector), a monitor of a cellular phone, a Personal Digital Assistant, and a head mount display, an image display device, a character indicating equipment, and a segment indicating equipment.

[0689] What is necessary is for the above explanation to be a time of a display panel being a normally white mode, and just to make it into this reverse in normally black mode.

[0690] The turbo switch 934 in which the transfer switch (turbo switch) 935 is attached switches a normally black mode display (NB display) and a normally white mode display (NW display) to a body 912. This becomes effective especially, when using the macromolecule distribution liquid crystal display panel of a reflective mold as a display panel 21.

[0691] In the case of the outdoor daylight of the usual brightness, an image is displayed in NW mode. NW mode can realize a wide-field-of-view angle display. NB mode is used when very weak to outdoor daylight. In NB mode, since a direct observer will look at the light reflected in the pixel electrode when a liquid crystal layer is in a transparency condition, a display image can be seen brightly. In NB mode, an angle of visibility is extremely narrow. However, since a display image can be seen good even when outdoor daylight is feeble, it is used by the personal youth, and if it is short-time use, it will be convenient practically. Generally, since it is rare to use it, it usually indicates to NW display by NB mode, and only when continuing pressing down a turbo switch 934, it is constituted so that it may become NB mode display.

[0692] There is a point of having equipped the gamma transfer switch 935 as a description of the indicating equipment of (drawing 91). The gamma transfer switch 935 is a toggle switch, and enables it to switch a gamma curve by one touch. The color temperature of the incident light which carries out incidence of this to a display panel under the lighting of an incandescent lamp serves as white of about 4800K redness, and becomes about 7000k blueness white by the fluorescent lamp of daylight color, and, outdoors, becomes about 6500k white.

[0693] Therefore, the color of the display image of a display panel changes with locations using the display 21 of (drawing 91). Especially this sense of incongruity is large when it moves from under the lighting of a fluorescent lamp to the bottom of the lighting of an incandescent lamp. By choosing the GAMAN transfer switch 935 at this time, a color temperature changes immediately and can look a display image normal.

[0694] The red gamma curve is made for the permeability (percent modulation) of liquid crystal to become small as the gamma transfer switch 935 serves as a good white display with the light of an incandescent lamp. Moreover, once it pushes, blue permeability (percent modulation) is made to become small so that it may apply to the fluorescent lamp of daylight color. If it pushes further once again, he is trying to become the best white display under sunlight. Therefore, a user has a good display image seen under any illumination light by choosing the gamma transfer switch 935.

[0695] In order to solve being displayed in white according to the direction where an observer looks at an image, there is also a view which switches NW mode and NB mode about the video signal inputted into a display panel 21. Although especially an angle of visibility is narrow at the time of NB mode, since display brightness has the special feature made very brightly, it is effective in a personal digital assistant, information machines and equipment, etc. which need security.

[0696] A switch in NW mode and NB mode is easy to realize when digital processing of the video-signal processing is carried out. It is because it will become the image data of NB if bit flipping of the image data in NW is carried out. Therefore, when using it in NB mode, black and white of an image are reversed.

[0697] It is important that an observer has NB mode and NW mode switched freely here. NB mode and NW mode are switched so that a display image may look the optimal according to the optical incidence condition to a display panel 21, and the observation direction of a display panel 21. Switches, such as the user carbon button 934, perform a change. After a user pushes a carbon button 934, the pushed period, or a carbon button, it is made to be in the display condition in NB mode during a fixed period. A fixed period can be made to carry out adjustable by the program. Moreover, as long as it pushes a carbon button depending on a configuration, you may constitute so that it may become NW mode.
 [0698] With a natural thing, the location of an observer's eye and the direction of incident light may be detected automatically by a phot sensor etc., and NW mode and NB mode may be switched automatically. Moreover, the strength of outdoor daylight may be detected automatically and MW mode and NB mode may be switched. Moreover, the message of a mode switch is displayed on the display screen of a display panel, and it is good even if good in the MANINTA face to a user.

[0699] If a display panel is reflection and this will be transparency, it can apply either. Moreover, by other spontaneous light methods not only like PD display panel but TN display panel, it is applicable also to a display panel or a display.

[0700] (Drawing 91) is the configuration of having attached the display as a monitor of a video camera. It is not limited to this configuration but the configuration (drawing 92 (drawing 94)) of a Personal Digital Assistant etc. can be applied like (drawing 93).

[0701] In (drawing 93), the projection 932 is formed in the covering 915 in which the mirror 921 was attached, this projection 932 is stopped, and it is constituted so that it may insert and fix to the section 933.

[0702] (Drawing 95) is the sectional view of (drawing 93). In order to strengthen the directivity of the light which carries out outgoing radiation from a light emitting device 11, and in order to prevent the light emission to an unnecessary direction, the mirror 144 is formed near the light emitting device 11. The Fresnel lens of the reflective mold which consists of a metal is formed in covering 915. Optical 18a emitted from a light emitting device 11 is changed into abbreviation parallel light 18b with Fresnel lens 921, and carries out incidence to a display panel 21. Display panels 21 are scattered about in incident light 18b, and at the time of NW mode, 18d of this scattered light is observed by the observer, and they serve as a display image. It is set to optical 18c on which the liquid crystal layer reflected regularly in the transparency condition completely. In addition, although 18b considered as parallel light, it may not be limited to this and you may be convergence light or the diffused light.

[0703] When a display panel 21 is a transfective specification, a back light 16 is arranged at the rear face of a

display panel 21. By making a back light 16, a light emitting device 11, and both turn on, a bright display image is obtained and the viewing-angle range is also expanded. In addition, the display panel 21 of this invention forms the antireflection film in the field which touches air. Moreover, the brilliance control of the display screen can be easily performed by carrying out flashing actuation of the light emitting device 11.

[0704] (Drawing 96) is the case where a light emitting device 11 is the point light source (small light source), in (drawing 95). The light emitted from the light emitting device 11 is changed into abbreviation parallel light by three-dimension-like paraboloid (concave surface) mirror 921a. Like (drawing 97), like fluorescence tubing, if the light source uses two-dimensional parabolic mirror 921b, in the case of a linear light source, it can form optical 18b of abbreviation parallel light.

[0705] (Drawing 92) etc. -- **** -- although the parabolic mirror 921 was set to one, it is good also as plurality like (drawing 98) (drawing 93). In (drawing 98), although light emitting device 11a is arranged near the focal location of parabolic mirror 921a and a base arranges light emitting device 11b near the focal location of paraboloid 921b, it does not limit to this. Moreover, the configuration in which parabolic mirrors 921a and 921b share the display screen of a display panel 21 every $[2 / 1/]$ may be used, and the lighting field of 921a and the lighting field of 921b may be piled up (that is, the whole region of a display panel is illuminated with both parabolic mirrors 921a and 921b). It can respond easily by designing a focal distance with parabolic mirrors 921a and 921b, and the location of a light emitting device 11 proper.

[0706] In addition, with the configuration of (drawing 98), in order to raise the directivity of the light by which outgoing radiation is carried out from a light emitting device 11, the lens 795 is arranged to the outgoing radiation side. Moreover, although the parabolic mirror 921 is illustrated like the parabolic mirror which has a curved surface, it may be Fresnel-ized like (drawing 95 (b)), and may be constituted in a plane.

[0707] Although light emitting devices 11a and 11b may always turn on both sides, flashing actuation may be carried out by turns. A flashing period is set to at least 30Hz or more. It is because a flicker occurs above 30Hz.

[0708] (Drawing 99) is a configuration which carries out polarization separation of the light emitted from one light emitting device 11, and illuminates a display panel 21. What is necessary is just to reset the part of the light emitting devices 11a and 11b of (drawing 98) in the configuration of (drawing 99).

[0709] In (drawing 99), it dissociates in respect of [872] optical separation of PBS871, and the light 18 emitted from the light emitting device 11 goes straight on, and carries out incidence of the P polarization 18b to field lens 795b. On the other hand, after optical-path adjustment is carried out by the relay lens 991, it is reflected by the mirror 892, and reflected S polarization 18a is changed into P polarization with $\lambda/2$ plate 893, and carries out incidence to field lens 795a. Next actuation is the same as that of (drawing 98).

[0710] With the configuration of (drawing 99), a display panel 21 can be illuminated by P polarization. Especially when illuminating by polarization, it is desirable to arrange a polarizing plate to the appearance plane of incidence of a display panel 21. The polarization shaft of a polarizing plate (film) is made in agreement so that P polarization may penetrate good. Moreover, even when using a polarizing plate, it cannot be overemphasized that it is desirable to form an antireflection film in the front face. In addition, minute irregularity may be formed in optical plane of incidence. For example, it is embossing. Any of the method which forms resin on a display panel 21 and is formed with an imprint technique, the method which sticks the sheet which performed embossing, and the method which produces irregularity for the front face of a display panel chemically or mechanically are sufficient as embossing.

[0711] moreover -- etc. (drawing 98 (drawing 92)) etc. -- in a display, it cannot be overemphasized by arranging light emitting devices in three primary colors, such as R, G, and B, and blinking these one by one that a field sequential display may be realized. About the configuration in this case, since it is explaining, it omits (drawing 90 (drawing 87)).

[0712] in addition -- omitting -- not indicating -- ** -- even if the matter indicated by this detail letter does not have explanation, and even if it is not illustrated, it cannot be overemphasized that it is mutually applicable. It is the matter indicated in one specification, and is because every one configuration is not only indicated to details.

[0713] Moreover, a similar configuration is also employable. For example, in this invention, it is supposed that EL back light can be used as a back light. For example, (drawing 39), it may set and 21b may be transposed to EL back light which can turn on each part the shape of a stripe, and in the shape of a matrix (putting out lights). In (drawing 40), 226b may be transposed to this appearance at EL luminous layer. Furthermore, in (drawing 39), the configuration of having made 226b into EL luminous layer, and having deleted 222b may be used. That is, EL luminous layer pinched between the array substrate 221, or opposite substrate 222a and the scan substrate 392 is formed. For example, after producing liquid crystal display panel 21a and, producing the scan substrate 392 in which EL luminous layer and the scan electrode were formed, on the other hand, the configuration which makes this scan substrate 392 and liquid crystal display panel 21a rival is illustrated. In order to make beam ***** good, the location ***** marker is formed in the periphery of the scan substrate 392 and display-panel 21a. A location ***** marker is good to form in the formation process of TFT241, the formation process of an EL element, and coincidence. In addition, mercury ion may act with a fluorescent substance and EL luminous layer may be transposed to the firefly luminescence component or firefly luminescence layer which generates the light. In addition, you may transpose to the shape of a field, the punctiform LED formative layer, and a laser generating layer.

[0714] In addition, (drawing 114 (drawing 79)), in a projection mold display, an image display condition and a black display condition can be switched by carrying out lighting actuation of the light emitting device 11 in displays (drawing 98 (drawing 93 (drawing 91))), such as carrying out flashing actuation of the light emitting device 11 in viewfinders (drawing 88 (drawing 87 (drawing 82))), such as carrying out flashing actuation of the lamp 791, etc.

[0715] This is the same as the implementation of image display and a black display by blinking the back light 16 explained above and operating the scan electrode 393. Therefore, indicating equipments, such as a viewfinder of these this inventions, can also improve animation dotage sharply. Therefore, what (it should apply) the drive approach explained using - (drawing 1) (drawing 78) etc., a flashing period, circuitry, etc. are [a thing] applicable also to the display of future (drawing 79) this inventions cannot be overemphasized.

[0716] It is clear that it is easily realizable with a configuration [especially / (drawing 98)] to change the upper part and the lower part of a screen of a display panel 21 by turns into a black display / image display condition. In addition, although a light emitting device is set to two in (drawing 98), it may not limit to this, and three or more pieces are sufficient, and it cannot be overemphasized by carrying out sequential flashing of these three or more light emitting devices 11 that the sequential selection of the image display location of a display panel 21 can be carried out.

[0717] Although the viewing areas of a display panel 21 are 20 inches or less and a comparatively small case for the above, if it becomes large-sized with 30 inches or more, the display screen will tend to bend. For the cure, by this invention, as shown in (drawing 100), the outer frame 1001 was attached to the display panel 21, and the holddown member 1002 is attached so that an outer frame 1001 may be hung and it may be lowered. As shown using this holddown member 1002 (drawing 101), it attaches in a wall 1011 in screw 1012 grade.

[0718] However, weight will also become heavy if the size of a display panel 21 becomes large. Therefore, the foot installation section 1004 is arranged to the display-panel 21 down side, and it enables it to hold the weight of a display panel 21 on two or more foot.

[0719] A foot is movable to right and left, as shown in A, and the foot 1003 is constituted so that it can contract, as shown in B. Therefore, even if it is a narrow location, a display can be installed easily. In addition, 1542 is a remote control receive section which receives a channel switch signal, a gamma change signal, etc.

[0720] Moreover, it is desirable to attach the elastic heights material 1021 in the front face of a display panel 21, as shown in the (drawing 102 (a)). The heights material 1021 is formed with these composites, such as elasticity phenol resin, silicone rubber, an elasticity epoxy resin, and pro poly pyrene resin. These prevent that the liquid crystal layer 226 is destroyed by the press by people's hand etc. while protecting the front face of a display panel 21. Moreover, breakage of a display panel 21 or 10,000 prevents scattering, when a display panel is divided into 1. Moreover, there is also an operation which extends a viewing angle by making a front face into the convex surface of transparence.

[0721] in addition, in order that it may be desirable to perform embossing on a front face preferably and it may protect from ultraviolet rays, the ultraviolet-rays cut film is attached -- it is -- it is -- forming is desirable.

Moreover, a feeling of contrast appears in the display image of a display panel 21 by adding little black or blue coloring matter or a color to the heights material 1021. Moreover, an optical little dispersing agent may be added. This is the same also in the (drawing 102 (b)).

[0722] As shown in the (drawing 102 (b)) as other configurations, the configuration which fills up the convex covering 1022 with liquids, such as gels, such as silicon gel, and ethylene glycol, is also effective (optical coupling layer 126). comparatively -- lightweight -- moreover, a price -- easy -- it is because formation production is also easy. As for the convex covering 1022, forming with polyester resin etc. is desirable. Moreover, an antireflection film is formed in the front face of the convex covering 1022.

[0723] In addition, although 1021 considered as convex in (drawing 102), it does not limit to this. For example, a plane is sufficient and a concave surface-like is sufficient depending on the case. In addition, a concave construct and a convex construct may be combined. Moreover, a polarization film may be used as convex covering 1022, and as the (drawing 102 (a)) explained, colors, such as black, coloring matter, etc. may be added in the optical coupling layer 126, or you may add to covering 1022. moreover, (drawing 102) -- setting -- heights material -- three dimensions (the shape of a lens) -- even if -- 2-dimensional-like (shape of boiled fish paste) any are sufficient. In addition, it does not limit to the heights material 1021 making it stick with the liquid crystal display panel 21 completely. It cannot be overemphasized that a fixed air gap may be prepared. In addition, the heights material 1021 etc. may not be limited to a convex configuration, and a concave configuration is sufficient as it. Moreover, by making a concave configuration and a convex configuration approach and arranging, forward power and negative power are negated, and it suits, and is good also as plate-like power (with no lens effectiveness) seemingly.

[0724] When it constitutes television from a configuration like (drawing 100), it is desirable to enable it to fold up, as shown in (drawing 154). In the (drawing 154 (a)), the flat-surface loudspeaker 1541 is attached in body 1001b, and the display panel 21 is attached in body 1001a. Bodies 1001a and 1001b are foldable with the rotation section 914, as shown in the (drawing 154 (b)). Thus, if constituted, the loudspeaker section will serve as a protective cover of a display panel 21.

[0725] Cost will become high if a display panel 21 becomes large-sized. Development of the low-temperature polish recon technique which forms the polish recon film is prosperous by vapor-depositing an amorphous silicon thin film to the array substrate 221, since this technical problem is coped with, and annealing this thin film using excimer laser etc. Although Sumitomo Heavy Industries etc. is developing excimer laser etc., almost all the equipments pull and lengthen a laser beam in the shape of a slit, and a substrate is irradiated and moved. A technical problem is the die length of the slit made into the shape of this slit. Usually, it is 20-30 (cm) extent. Therefore, the size of the display panel 21 which can be created with this slit die length will be determined. It is for the semi-conductor property of the joint section of a slit worsening, and not functioning as a component.

[0726] Although the semi-conductor film formation by excimer laser annealing has the merit made to low cost, TFT of a pixel etc. has the technical problem that a property needs to form that it is bad in a peripheral driver and

coincidence to a good part. A manufacture throughput (baton) cannot be improved because of this technical problem.

[0727] In order that the manufacture approach of the display panel of this invention may cope with this technical problem, a peripheral-driver circuit is divided and formed and semi-conductor film, such as TFT of a pixel, anneals only a required part in the shape of a spot.

[0728] (Drawing 103) is an explanatory view for explaining a display panel, and its manufacture approach and manufacturing installation of this invention. (Drawing 103) explains the case where four array substrates 221a, 221b, 221c, and 221d are produced to one glass substrate 1032, in order to give explanation easy.

[0729] The slash section shows the excimer laser head 1031. A thing required for explanation is the slit [not a laser head but]-like beam width L1. Now, it explains that the dip of display screen 107a is beam width L1 in order to give explanation easy. Moreover, it is explained that the overall length of the source driver 102 which the breadth of a display screen is larger than L1, and needs it is L2 [larger] than L1.

[0730] If it is going to carry out laser annealing of the one glass substrate 1032 and a laser head is not scanned at least 3 times as shown in 1031c, 1031d, and 1031e, all viewing areas cannot be annealed. However, if the laser head 1031 is scanned, as for the semi-conductor for next the eye, for example, laser head 1031c, and 1031d, a property will worsen. In order to cope with this technical problem, this invention does not form a transistor component in the eye [next] part of the laser head 1031, but is dividing it like source driver 102a and 102b, 102c, and 102d.

[0731] The condition of having divided is shown in (drawing 104). The range enclosed by the dotted line in (drawing 104) is the field in which semiconductor device transistor components, such as a shift register, a driver circuit, an inverter, an analog switch, and the transfer gate (TG), were formed. Array substrate 221a consists of two source driver circuit groups 102a and 102b. The semiconductor device is not formed in the range of A which serves as next eye so that clearly also from (drawing 104). Only metal wiring of aluminum etc. is formed.

[0732] That is, as shown in (drawing 104), the power-source wiring 1041 and control signal line 1042 grade are formed in the range of A, and semiconductor devices, such as a switching element, are not formed. The range of this A is because it corresponds between the laser heads 1031 (that is, width of face scanned one time), the property of a semi-conductor worsens and a good semiconductor device cannot be formed. Although the range of A (width of face) is based on the property of annealing means, such as excimer laser, it is usually 20 micrometers to about 100 micrometers.

[0733] With the display panel of this invention, it is characterized by not forming the semiconductor device of a driver component in the part beforehand located between laser heads as mentioned above.

[0734] Since a semiconductor device is not formed in the range of A, the semiconductor device which should be essentially formed in this range (configuration) is formed in the part of S1. Therefore, as the driver circuit near the A is shown in a dotted line, only the part of S1 is formed in the range where width of face is wide. It is necessary to wire the pixel electrode 230 between the range of A in the source signal lines 228 (228e, 228f, 228g, 228h, etc.). Therefore, the source signal line 228 is formed in a radial as shown in (drawing 104).

[0735] As shown in (drawing 103), laser red is positioned first in the location of 1031a, a laser beam is irradiated at the amorphous silicon film of gate driver 101a, and the polish recon film is formed by carrying out laser annealing. Next, it moves to the part which forms gate driver 101b, and a laser beam is irradiated at the amorphous silicon film, and laser annealing is carried out. Then, a laser head moves to the location of 1031b, irradiates a laser beam in a gate driver 101c location, performs laser annealing, and irradiates a laser beam in a gate driver 101d location, and performs laser annealing.

[0736] A laser head is similarly moved to the location of 1031c, a laser beam is irradiated in the formation location of source driver 102a, after that, it moves to a 102e location, 102b and a 102c location, 102f and 102g location, 102d location, and 102h location, laser annealing is performed, and the part of a source driver also forms the polish recon film.

[0737] In addition, this invention is characterized by dividing the semiconductor device currently formed continuously by regulation of equipments, such as width of face of a laser head, conventionally [, such as a source driver circuit or a gate driver circuit,]. Therefore, after moving a laser head from a 1031c location and completing the semi-conductor film of a 102a location and viewing-area 107a, it cannot be overemphasized that the semi-conductor film may be continuously formed in a 102e location. The next scan is started from 1031d location.

[0738] As a viewing area 107 is shown in (drawing 105), the switching element and the pixel electrode 230 are formed. Among these, a part [need / the semi-conductor film / to be formed] is only the gate terminal 242 section. That is, it is not necessary to carry out laser annealing in the part of the pixel contact hole 1052, the drain terminal 244, the source terminal 243, the source signal line 228, and the gate signal line 415.

[0739] Then, as shown in (drawing 106), a laser beam is irradiated in the shape of a spot, and laser annealing is performed only in the location which forms switching elements, such as TFT. The good semi-conductor film is formed by piling up a laser spot in five (micrometer) to 15 (micrometer) pitch still more preferably, shifting laser spot 1061 a-f a little in five (micrometer) to 30 (micrometer) pitch. TFT etc. is formed on this laser spot 1061 location.

[0740] As shown in (drawing 108), a spot-like laser beam irradiates the polygon mirror 1082, and irradiates a laser beam 1081 at a glass substrate 1032 using the 1st lens 1083 and the 2nd lens 1084. The range W which can be once irradiated by positioning is 30 (cm) extent. This part out of range moves a laser head, positions and is irradiated again.

[0741] The outline of the equipment which irradiates a slit-like laser beam is shown in (drawing 109). It leads to the image formation optical system 1093, reflecting a laser beam 1081 by the laser mirrors 1091a, 1091b, and 1091c.

The image formation optical system 1093 forms the slit-like beam 1092, as shown in (drawing 109), it irradiates this beam 1092 at a glass substrate 1032, and performs laser annealing. In addition, it is good to use a homogenizer in this optical system.

[0742] A slit 1101 may be arranged so that the optical system shown in (drawing 110) (drawing 109). The laser beam outgoing radiation hole 1102 in which the slit 1101 was formed in accordance with the pixel pitch is formed. By making a viewing area 107 carry out sequential migration of this slit, a laser beam can be irradiated in the part of the pixel TFT of the range where ** also corresponds to a 1-pixel line at once not using the polygon mirror 1082 as shown in (drawing 108). Therefore, laser annealing can be performed at a high speed.

[0743] By carrying out the image processing of the marker 1071 of a glass substrate 1032 first on the 1st stage (the 1st process), as shown in (drawing 107), location detection is performed and a glass substrate 1032 is positioned. A marker 1071 forms in an array formation process. The positioning line laser heads 1031a and 1031c are operated, and laser annealing of the need part is carried out. In addition, the laser head 1031 may be performed by one, or may be used. [two or more]

[0744] Next, it positions by the marker 1071 also on the 2nd stage (the 2nd process), and the optical system using the polygon mirror 1082 shown in (drawing 108) performs shortly laser annealing of the part which forms TFT. In addition, the 1st process and the 2nd process may be replaced, and it is simultaneous in the 1st process and the 2nd process, and good in a line (at the same process).

[0745] Since the mobility of TFT may be small, when the TFT field of a viewing area 107 does not have to carry out laser annealing, it is not necessary to use the optical system which consists of a polygon mirror. That is, the parts of the source driver 102 and a gate driver 101 perform and form laser annealing into polish recon, mobility is increased, and a viewing area 107 forms TFT with an amorphous condition. If it is this method, an annealing process is a short time, it can end, and a manufacture baton can be raised.

[0746] In addition, although [the example of this invention] annealed with laser, the method which will not limit to this and will exceed a semi-conductor layer and to grow up may be used. In this case, what is necessary is just to give the growth process which will pass preponderantly the part which forms a driver.

[0747] It has mainly been explained that the opposite substrate 222 and the array substrate 221 use substrates, such as a glass substrate, a transparen ceramic substrate, a resin substrate, a single crystal silicon substrate, and a metal substrate, in the display panel of this invention, and a display. However, the opposite substrate 222 and the array substrate 221 may use a film or sheets, such as a resin film.

[0748] For example, polyimide, PVA, cross-linked polyethylene, polypropylene, a polyester sheet, etc. are illustrated. Moreover, in the case of PD liquid crystal, a direct counterelectrode or TFT may be formed in a liquid crystal layer like JP,2-317222,A. That is, an array substrate or an opposite substrate does not have the need constitutionally. Moreover, when it is in IPS mode (comb electrode method) which Hitachi is developing, as for a counterelectrode, there is no need in an opposite substrate.

[0749] The light modulation layer 226 may not be limited only to liquid crystal, and 9/65/35PLZT with a thickness of about 100 microns, or 6/65/35PLZT is sufficient as it. Moreover, what added the fluorescent substance in the light modulation layer 226, the thing which added the polymer ball, the metal ball, etc. in liquid crystal may be used.

[0750] In addition, although transparent electrodes, such as 225 and 230, were explained as ITO, it may not limit to this and transparent electrodes, such as SnO₂, an indium, and indium oxide, are sufficient. Moreover, what vapor-deposited metal thin films, such as gold, thinly is also employable. Moreover, the transparent conductive coating material "SHINTORON" which the organic electric conduction film, ultrafine particle distribution ink, or TORAY is commercializing may be used.

[0751] Although the light absorption film 146 grade added carbon etc. to acrylic resin etc., optical diffusion objects, such as the thin film in which detailed irregularity was formed on black metals, such as others and hexavalent chromium, the coating, and the front face, a thick film or a member, titanium oxide, an aluminum oxide, a magnesium oxide, and opal glass, are sufficient as it. Moreover, it could be colored by a color, a pigment, etc. which have the relation of the complementary color to the light which the light modulation layer 226 modulates even if not black. Moreover, a hologram or a diffraction grating is sufficient.

[0752] The example of this invention has explained as an active-matrix mold which has arranged switching elements, such as TFT, MIM, and a thin-film diode (TFD), for every pixel electrode. DMD (DLP) which TI, Inc. where a minute mirror besides a liquid crystal display panel also displays an image as this active-matrix mold or a dot-matrix mold by change of an include angle is developing is also contained.

[0753] Moreover, switching elements, such as TFT, may not be limited to 1 pixel at one piece, and may be connected. [two or more] Moreover, as for TFT, it is desirable to adopt LDD (low doping drain) structure.

[0754] The technical thought of each example of this invention is applicable also to EL display panel besides a liquid crystal display panel, an LED display panel, a FED (field emission display) display panel, and PDP. Moreover, not the thing to limit to an active-matrix mold but a simple matrix type may be used. Also with a simple matrix type, the intersection has a pixel (electrode) and can regard it as a dot-matrix mold display panel. Of course, the reflective mold of a simple matrix panel is also the technical category of this invention. In addition, it cannot be overemphasized that it is applicable also to the display panel which displays a notation with eight simple segments etc., a character, a symbol, etc. These segment electrode is also one of the pixel electrodes.

[0755] It cannot be overemphasized that the technical thought of this invention is applicable also to a plasma address type display panel. In addition, the technical thought of this invention is applicable also to the mold display panel write-in [optical] which does not have a pixel concretely, a heat write-in mold display panel, and a laser

write-in mold display panel. Moreover, the projection mold display using these could also be constituted.

[0756] Any of a common electrode method and a preceding paragraph gate electrode method are sufficient also as the structure of a pixel. In addition, the electrode of the shape of a stripe which becomes the array substrate 221 from ITO along with a pixel line (longitudinal direction) may be formed, and storage capacitance may be formed in the pixel electrode 230 and said stripe-like inter-electrode. Thus, by forming storage capacitance, the capacitor of juxtaposition will be formed in the liquid crystal layer 226 as a result, and the electrical-potential-difference retention of a pixel can be improved. TFT271 formed by low-temperature polish recon, elevated-temperature polish recon, etc. has the large OFF state current. Therefore, it is very effective to form this stripe-like electrode.

[0757] Moreover, the mode (it indicates without distinguishing the mode, a method, etc.) of a display panel is applicable to STN mode [besides PD mode], ECB mode, DAP mode, TN mode, strong dielectric liquid crystal mode, DSM (dynamic scattering mode), perpendicular orientation mode, guest host mode, HOMEOTORO pick mode, smectic mode, and cholesteric mode etc.

[0758] The display panel/display of this invention may not be limiting to PD liquid crystal display panel / PD liquid crystal display, either, but other liquid crystal, such as TN liquid crystal, STN LCD, cholesteric liquid crystal, DAP liquid crystal, ECB liquid crystal mode, an IPS method, strong dielectric liquid crystal, antiferroelectric, and OCB, is sufficient as it. In addition, a method like PLZT, electrochromism, electroluminescence, a LED display, an EL display, a plasma display (PDP), and plasma addressing may be used.

[0759] The technical thought of this invention Moreover, a video camera, a liquid crystal projector, stereoscopic television, Projection TV, a viewfinder, the monitor of a cellular phone, PHS, a Personal Digital Assistant and its monitor, a digital camera, and its monitor, An electrophotography system, a head mount display, an accepting-reality monitor display, A note personal computer, the monitor of a video camera, the monitor of an electronic "still" camera, The monitor of a cash automatic drawer machine, the monitor of a public telephone, the monitor of a TV phone, It cannot be overemphasized to a personal computer monitor, a liquid crystal wrist watch and its display, the liquid crystal display monitor of a homeuse-electronics device, the time stamp section of a deferment clock, a pocket game device and its monitor, the back light for display panels, etc. that application or application expansion can be carried out.

[0760] Moreover, the lighting system of this invention is the program documentation medium which recorded the program and/or data for performing the function of the all or some means [all or a part of] by computer, and may be used as a program documentation medium characterized by for said program and/or data possible and read by computer cooperating with said computer, and performing said function.

[0761] Moreover, the graphic display device of this invention is the program documentation medium which recorded the program and/or data for performing the function of the all or some means [all or a part of] by computer, and may be used as a program documentation medium characterized by for said program and/or data possible and read by computer cooperating with said computer, and performing said function.

[0762] Moreover, the drive approach of the graphic display device of this invention is the program-documentation medium which recorded the program and/or the data for performing actuation of the all or some processes [all or a part of] by computer, and may be used as a program-documentation medium characterized by for said program and/or data possible and read by computer to cooperate with said computer, and to perform said function.

[0763] Moreover, the drive approach of the liquid crystal display panel of this invention is the program-documentation medium which recorded the program and/or the data for performing actuation of the all or some processes [all or a part of] by computer, and may be used as a program-documentation medium characterized by for said program and/or data possible and read by computer to cooperate with said computer, and to perform said function.

[0764]

[Effect of the Invention] This invention demonstrates characteristic effectiveness according to each configuration of the improvement of animation dotage, low-cost-izing, a raise in brightness, etc. so that clearly from the place explained above.

[Translation done.]